Final

Removal Action Work Plan
Non-Time-Critical Removal Action for the Building 965 Area

Former Department of Defense Housing Facility
Novato, California

October 2009

Prepared for:
Base Realignment and Closure
Program Management Office West
San Diego, California

Prepared by:
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Prepared under:
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Submitted by:
Engineering/Remediation Resources Group, Inc.

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Table of Contents

SECTION 1. INTRODUCTION 1-1

1.1. Scope of Work 1-1
1.2. Project Organization 1-2
1.3. Schedule 1-3
1.4. Work Plan Organization 1-3

SECTION 2. SITE CONDITIONS AND BACKGROUND 2-1

2.1. Physical Characteristics 2-1
2.1.1. Geologic Setting 2-2
2.1.2. Hydrologic Setting 2-2
2.2. Chemical Characteristics 2-2

SECTION 3. REGULATORY FRAMEWORK 3-1

SECTION 4. PROJECT AND PERSONNEL REQUIREMENTS 4-1

4.1. Project Manager 4-1
4.2. Project Quality Control Manager 4-2
4.3. Site Superintendent 4-2
4.4. Site Safety and Health Officer 4-2

SECTION 5. PLANNED REMOVAL ACTIVITIES 5-1

5.1. Mobilization and Site Preparation 5-1
5.1.1. Permitting and Notifications 5-2
5.1.2. Utility Identification, Clearance, Avoidance, and Protection 5-2
5.1.3. Topographical Survey 5-3
5.1.4. Work Areas and Site Security 5-3
5.1.5. Vegetation Clearing 5-4
5.1.6. Asbestos-Containing Material and Lead-Based Paint Abatement 5-4
5.2. Air Monitoring 5-4
5.3. Building Deconstruction 5-6
5.4. Asphalt Pavement and Concrete Removal 5-6
5.5. Pre-Excavation Sampling 5-6
5.6. Soil Excavation 5-7
5.6.1. Migration Control Measures 5-8
5.6.2. Spill Prevention and Control Measures 5-9
5.7. Post-Excavation Confirmation Sampling (Soil) 5-9
5.8. Backfill Placement and Compaction 5-10
5.9. Waste Classification, Storage, and Disposal 5-11

Table of Contents *(continued)*

5.10. Post-Excavation Confirmation Sampling (Soil Gas) 5-11
5.11. Contingency Actions 5-12
5.11.1. Unpredicted Inclement Weather 5-12
5.11.2. Utility Line Breaks 5-12
5.11.3. Soil Vapor Extraction System 5-14
5.12. Demobilization 5-14
5.13. Update Existing Risk Assessment 5-14
5.14. After Action Summary Report 5-14
5.15. No Further Action Letter 5-15

SECTION 6. WASTE MANAGEMENT PLAN 6-1
6.1. Excavated Soil 6-2
6.2. Disposable Sampling Equipment and Personal Protective Equipment 6-3
6.3. General Construction Debris 6-3

SECTION 7. QUALITY CONTROL PLAN 7-1
7.1. Purpose of the Construction Quality Control Plan 7-1
7.2. Quality Control Organization 7-1
7.2.1. Navy Team 7-2
7.2.2. Remedial Action Contractor 7-2
7.2.3. Meetings 7-3
7.2.4. Readiness Review 7-4
7.3. Definable Features of Work 7-4
7.4. Control Phases and Inspections 7-4
7.4.1. Preparatory Phase 7-5
7.4.2. Initial Phase 7-6
7.4.3. Follow-Up Phase 7-6
7.4.4. Completion Inspections 7-6
7.5. Deficiencies and Corrective Actions 7-7

SECTION 8. REFERENCES 8-1

List of Figures

Figure 1. Project Organization Chart
Figure 2. Site Location and Vicinity Map
Figure 3. Site Features Map
Figure 4. Conceptual Site Model
Figure 5. Work Zone Delineation
Figure 6. Removal Areas
Figure 7. Proposed Pre-Excavation Soil Gas Sampling Locations
Figure 8. Post-Excavation Soil Confirmation Sample Locations
Figure 9. Proposed Post-Excavation Soil Gas Sampling Locations

List of Tables

Table 1. Preliminary Project Schedule
Table 2. Pre-Excavation Soil Gas Sampling Locations and Rationale
Table 3. Notification List for Major Spills
Table 4. Analyses and Acceptance Criteria for Soil Backfill
Table 5. Post-Excavation Confirmation Soil Gas Sampling Locations and Rationale
Table 6. Proposed Waste Disposal Facilities

List of Appendices

Appendix A. Sampling and Analysis Plan
Appendix B. Field Forms
Appendix C. Asbestos and Hazardous Building Materials Survey Summary
Appendix D. Applicability Review of Bay Area Air Quality Management District Regulation 2 Permit, Rule 5, New Source Review of Toxic Air Contaminants
Appendix E. Responses to Regulatory Agency Comments on the Draft Removal Action Work Plan

Acronyms and Abbreviations

ACM	asbestos-containing material
APP	accident prevention plan
BAAQMD	Bay Area Air Quality Management District
Battelle	Battelle Memorial Institute
BMPs	best management practices
bgs	below ground surface
CFR	Code of Federal Regulations
CO	Contracting Officer
COCs	chemicals of concern
CSO	Caretaker Site Officer
CQCP	Construction Quality Control Plan
DFOW	definable feature of work
DoDHF	Department of Defense Housing Facility
DOT	Department of Transportation
DTSC	Department of Toxic Substances Control
EE/CA	Engineering Evaluation/Cost Analysis
EMAC	Environmental Multiple Award Contract
EPA	U.S. Environmental Protection Agency
ERRG	Engineering/Remediation Resources Group, Inc.
ESL	environmental screening level
HSM	Health and Safety Manager
LBP	lead-based paint
Navy	Department of the Navy
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NFA	no further action
NTCRA	non-time-critical removal action
NUSD	Novato Unified School District
OSHA	Occupational Safety and Health Administration

PBC	Public Benefit Conveyance
PM	project manager
PPE	personal protective equipment
PWC	Public Works Center
QA	quality assurance
QC	quality control
RAO	removal action objective
RAWP	Removal Action Work Plan
RBSLs	risk-based screening levels
RCRA	Resource Conservation and Recovery Act
ROICC	Resident Officer in Charge of Construction
RPM	Remedial Project Manager
RSL	regional screening level
SAP	sampling and analysis plan
SFRWQCB	San Francisco Regional Water Quality Control Board
SOW	scope of work
SSHO	site safety and health officer
SSHP	site safety and health plan
STLC	soluble threshold limit concentration
SVE	soil vapor extraction
TAC	toxic air contaminant
TCLP	toxic characteristic leaching procedure
TTLC	total threshold limit concentration
VOC	volatile organic compound
WET	waste extraction test
§	Section

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Section 1. Introduction

This Removal Action Work Plan (RAWP) describes specific field activities pertaining to the non-time-critical removal action (NTCRA) to be performed within Public Benefit Conveyance (PBC) Parcel 1A, Building 965 Area, at the former Department of Defense Housing Facility (DoDHF) in Novato, California. Engineering/Remediation Resources Group, Inc. (ERRG) will perform the NTCRA as a contractor to the Department of the Navy (Navy). Battelle Memorial Institute (Battelle), as a subcontractor to ERRG, will provide human health risk assessment services and technical support for this project.

The NTCRA involves deconstruction of existing Buildings 965 and 969, removal of asphalt pavement and concrete surrounding Building 965 and overlying the associated wash pad, and excavation of soil beneath the wash pad, to address subsurface soil and soil gas contaminated with volatile organic compounds (VOCs) at concentrations that pose a potential risk to humans. The NTCRA was developed and evaluated in an Engineering Evaluation/Cost Analysis (EE/CA) to address the following removal action objective (RAO) developed for soil gas at the site (Battelle, 2009a):

- To reduce and/or manage human health risk to acceptable levels

The Navy selected the planned removal action in an Action Memorandum (Navy, 2009).

This RAWP describes the construction-oriented field activities to be performed as part of the NTCRA. The sampling and analysis plan (SAP) describes the soil and soil gas sampling planned to confirm the effectiveness of the NTCRA (Appendix A). Following field activities and receipt of all analytical results, ERRG and Battelle will prepare a site-wide update of the "Final Revised Risk Assessment for Former Underground Storage Tank Site 957/970 at the Department of Defense Housing Facility, Novato, California" (Battelle, 2006). An After Action Summary Report also will be prepared to summarize the work performed to achieve the RAO. After the RAO is achieved, the Navy will prepare a letter requesting concurrence for a No Further Action (NFA) determination for the site from California Department of Toxic Substances Control (DTSC).

1.1. SCOPE OF WORK

ERRG's scope of work (SOW) includes deconstruction of existing Buildings 965 and 969, removal of asphalt and concrete surrounding Building 965 and overlying the associated wash pad, and removal of subsurface soil and soil gas beneath the wash pad containing VOCs. The SOW includes the following tasks:

- Preparation of this RAWP
- Preparation of an accident preparation plan (APP) and site safety and health plan (SSHP) to be submitted under separate cover from this RAWP
- Mobilization and site preparation, including performing land surveys and identifying subsurface utilities prior to deconstruction activities
- Removal of loose and flaking lead-based paint (LBP) from Building 969[1]
- Abatement of asbestos-containing material (ACM) in Buildings 965 and 969[1]
- Tree removal
- Deconstruction and off-site disposal of Buildings 965 and 969
- Removal of asphalt and concrete surrounding Building 965 and overlying the associated wash pad to the south of the building
- Collection of soil gas samples prior to excavation
- Excavation of soil beneath the wash pad (above water table, to a depth of approximately 10 feet below ground surface [bgs])
- Collection of soil samples from the excavation bottom and sidewalls, collected from the excavator bucket, to confirm that all contaminated soil is removed
- Waste classification, storage, and disposal
- Placement of clean backfill and compaction testing with soil density meter
- Collection of soil gas samples following excavation to confirm VOCs are no longer present in soil gas
- Installation and operation of soil vapor extraction (SVE) system (Note: This is a contingency action to be implemented to meet the RAO if removal activities and land use controls alone will not be suitable to protect human health and the environment from the vapor intrusion pathway. If implementation of this optional scope of work item is determined to be necessary, an amendment to this RAWP will be prepared to outline installation and operational procedures for the SVE system.)
- Demobilization
- Preparation of an update to the existing risk assessment
- Preparation of an after action summary report and a letter requesting concurrence with a NFA determination from DTSC

1.2. PROJECT ORGANIZATION

The ERRG project team will consist of a Project Manager (PM), Site Superintendent, a Site Safety and Health Officer (SSHO), equipment operators, and field technicians. The ERRG PM will coordinate site

[1] Note: This task was conducted prior to finalizing this RAWP.

activities, oversee proper execution of the work, and provide the Navy with updates of field activities. The ERRG SSHO will implement the APP and SSHP.

The SSHO will report directly to Mr. Edward Grooman, the Corporate Health and Safety Manager (HSM), for issues relating to project safety and health. The ERRG Site Superintendent will supervise the field technicians, equipment operators, and subcontractors. The Site Superintendent will report to the PM. The project organization chart is shown on Figure 1.

1.3. SCHEDULE

Table 1 below provides the preliminary project schedule. The project schedule will be updated following review and approval of this RAWP.

Table 1. Preliminary Project Schedule

Task	Start	Finish
RAWP (including SAP and APP/SSHP)	04/22/09	10/16/09
Removal Action Fieldwork	10/19/09	11/22/09
Mobilization and Site Preparation (including building deconstruction, and asphalt pavement and concrete removal)	*10/19/09*	*10/23/09*
Pre-Excavation Soil Gas Sampling	*10/26/09*	*10/28/09*
Soil Excavation and Off-Site Disposal	*11/2/09*	*11/6/09*
Excavation Confirmation Sampling	*11/6/09*	*11/6/09*
Excavation Backfill and Compaction	*11/9/09*	*11/13/09*
Rebound Soil Gas Monitoring – Round 1	*12/14/09*	*12/16/09*
Rebound Soil Gas Monitoring – Round 2	*2/15/10*	*2/17/10*
Risk Assessment Update	2/17/09	4/5/10
After Action Summary Report	12/24/09	3/22/10
Letter Requesting NFA	5/5/10	5/15/10

1.4. WORK PLAN ORGANIZATION

The contents of this RAWP include the following sections:

- **Section 1:** Introduction
- **Section 2:** Site Conditions and Background
- **Section 3:** Regulatory Framework
- **Section 4:** Project and Personnel Requirements
- **Section 5:** Planned Removal Actions
- **Section 6:** Waste Management Plan
- **Section 7:** References

Figures are provided following Section 7. This RAWP also includes the following appendices that contain supporting information:

- Appendix A. Sampling and Analysis Plan
- Appendix B. Field Forms
- Appendix C. Asbestos and Hazardous Building Materials Survey Summary
- Appendix D. Applicability Review of Bay Area Air Quality Management District Regulation 2 Permit, Rule 5, New Source Review of Toxic Air Contaminants
- Appendix E. Responses to Regulatory Agency Comments on the Draft Removal Action Work Plan

Section 2. Site Conditions and Background

The former DoDHF is located in Novato, California, approximately 25 miles northwest of San Francisco in Marin County (Figure 2). Lanham Village is a residential housing area adjacent to the former DoDHF Novato, and is approximately 110 feet west of Building 965. In addition, a daycare and a youth center are located approximately 540 feet southeast of Building 965. The eastern border of the facility runs north-south from the intersection of Main Gate Road and C Street, and the western border runs north-south approximately 500 feet west of the intersection of Main Gate Road and C Street. Building 965 and the wash pad are located along the western boundary of the facility within Parcel 1A between Building 960 to the north and Building 969 to the south (Figure 3; Battelle, 2009a).

From the mid-1970s to the early 1990s, the Navy occupied the housing facility and various support operations, including the Public Works Center (PWC). Available documentation indicated that Building 965 was located within the PWC area and was previously used to support automotive maintenance activities. Currently, the Navy is seeking to transfer remaining PBC parcels, including Parcel 1A, to the Novato Unified School District (NUSD) in cooperation with the DTSC's Office of Military Facilities and School Site Program (Battelle, 2009a).

Parcel 1A, which contains Building 965, is not used for any military or civilian activity at this time. Primary activities at the former DoDHF Novato include groundwater monitoring associated with ongoing groundwater cleanup activities at former Underground Storage Tank Site 957/970. The former DoDHF Novato is an inactive military facility with restricted public access (Battelle, 2009a). Roads are accessible to large trucks and equipment and lead directly to the Building 965 Area.

2.1. PHYSICAL CHARACTERISTICS

The Building 965 Area includes Buildings 965 and 969, the wash pad located in between the two buildings, and the paved areas surrounding both Building 965 and the wash pad. Buildings 965 and 969 are one-story structures, which are weathered and degrading due to lack of maintenance. Building 965 is approximately 674 square feet, and Building 969 is approximately 3,308 square feet. The wash pad is about 1,891 square feet.

2.1.1. Geologic Setting

The site geology consists of Late Pleisocene to Holocene unconsolidated alluvial materials (i.e., sands, silts, gravels, and clays) encountered in varying portions and depths eroded from the Mendocino Range, located to the west of the former DoDHF Novato. Bedrock is encountered at approximately 15 feet bgs but increases in depth toward the north. Bedrock underlying the site is significantly less permeable than the alluvial materials and acts to enhance lateral groundwater flow within the alluvium and limit downward flow. Depth to groundwater is approximately 10 feet bgs, although depths vary to some extent throughout the year. The direction of groundwater flow is toward the north at approximately 100 feet per year. The site is approximately 33 feet above mean sea level (Battelle, 2009a).

2.1.2. Hydrologic Setting

The facility is approximately 9,400 feet west of San Pablo Bay and 4,800 feet south of Ignacio Reservoir (Pacheco Pond). Pacheco Creek is the nearest surface water body to the facility and is located approximately 800 feet to the northwest. The creek flows to the north along the western border of the facility in a subsurface culvert starting from Main Gate Road and ending at the railroad tracks, north of the site. Analytical results have indicated that groundwater does not enter the creek along the subsurface culvert. Therefore, the culvert does not serve as a preferential flow path for groundwater. At the railroad tracks, the creek surfaces and flows to the north-northwest into Pacheco Pond and eventually into San Pablo Bay. Overall, higher flow rates are typically observed in Pacheco Creek during the winter months (i.e., the wet season) compared with the summer months, indicating that the creek is recharged by storm water runoff during and following rainfall events. As explained in the existing risk assessment, shallow groundwater beneath DoDHF Novato is not likely to be used as a potential drinking water source due to the presence of high concentrations of total dissolved solids and low yield. Potable water is already supplied to the area by the municipality (Battelle, 2009a).

2.2. CHEMICAL CHARACTERISTICS

Past site investigations have identified VOCs in subsurface soil and soil gas at the Building 965 Area that pose a potential risk to humans. The primary source of VOCs in subsurface soil and soil gas is presumed to be vehicle rinsing on the former wash pad. Site investigations have found no evidence of a direct release of chemicals to the subsurface, but available information suggests that rinse water containing VOCs accumulated in the subsurface vadose zone (Battelle, 2009a). The primary chemicals of concern (COCs) identified at the Building 965 Area through past site investigations are benzene, 1,3-butadiene, cis-1,2-dichloroethene, ethylbenzene, and trichloroethene, and vinyl chloride.

Although direct releases are not suspected, incidental releases have likely occurred over time, resulting in the accumulation of chemicals in the subsurface at concentrations that pose an unacceptable risk under the planned future use of the site (Battelle, 2009a). Rinse water likely infiltrated into the vadose zone through small cracks in the overlying concrete and pavement and along a drainage path toward the western edge of the concrete pad. It is likely that rinse water remained in the shallow soil due to the limited volume and low permeability of the soils. The presence of the overlying pavement likely served as a barrier, limiting the diffusion of gaseous-phase VOC mass from the shallow soil and soil gas to the atmosphere.

Based on the most recent conceptual site model (Figure 4), deeper soils are observed to be relatively impermeable, indicating it is unlikely that a significant VOC mass is present in deeper soil gas. In addition, shallow and deep soil samples collected in the source area indicated a more pronounced presence of VOCs in the shallow soil, as opposed to deep soil, indicating a very low subsurface permeability that has resulted in most of the VOC mass being present in shallow soil and serving as a source to soil gas (Battelle, 2009a).

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Section 3. Regulatory Framework

The Navy identified, evaluated, and selected this NTCRA in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (Title 42 United States Code Sections [§§] 9601-9675) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (Title 40 Code of Federal Regulations Part 300). The NTCRA was identified and evaluated in the "Final Engineering Evaluation/Cost Analysis, Non-Time Critical Removal Action for the Building 965 Area at Parcel 1A, Department of Defense Housing Facility, Novato, California" (Battelle, 2009a).

The decision to undertake the NTCRA is documented in the "Action Memorandum for Non-Time-Critical Removal Action for the Building 965 Area, Former Department of Defense Housing Facility, Novato, California" (Navy, 2009).

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Section 4. Project and Personnel Requirements

The title, responsibilities, and authorities of key ERRG personnel assigned to this project are described in the following subsections. All project personnel will meet the following training and certification requirements:

- Site personnel must have Occupational Safety and Health Administration (OSHA) 40-hour health and safety and emergency response training.
- Site personnel performing Department of Transportation (DOT) functions (including selecting, packaging, marking, labeling, preparing shipping papers, and loading) must be trained in accordance with the requirements of Title 49 Code of Federal Regulations (CFR), Subpart H, Docket HM-126F. Subcontractors performing DOT functions must supply proof of training.
- All project personnel performing waste management will be trained in accordance with Title 40 CFR, § 265.16.
- All project personnel will attend a meeting on site hazards. The meeting will address what site hazards may be encountered and the procedures to follow if encountered.
- ERRG and subcontractor training records will be verified prior to the start of project activities.

4.1. PROJECT MANAGER

The PM is the single point of contact for the project. The PM is responsible for management and execution of activities in accordance with the approved SOW; approved work plans; and federal, state, and local laws and regulations. This work includes coordinating the activities of the groups, subcontractors, or teams working on the project.

The PM has the following specific responsibilities:

- Complete construction activities in accordance with contract specifications and drawings and approved planning documents.
- Ensure that work is conducted in a safe and environmentally sound manner (this includes ensuring coordination with the SSHO).
- Maintain close communication and coordination with the Navy for the duration of the project.
- Prepare the required reports and submitting them to the Navy in a timely manner.
- Immediately notify the Navy of problems with construction or safety and health procedures.
- Ensure that site personnel follow the approved procedures presented in the site-specific project plans.

The PM has the authority to stop work on any part of the job if it is found to be noncompliant with contract specifications or project plans. Further, the PM is authorized to institute corrective actions, as necessary, and to implement these changes, with client approval, in accordance with the provisions of the contract. The groups, subcontractors, and teams working on the project report to the PM and act at his direction.

4.2. PROJECT QUALITY CONTROL MANAGER

The Project Quality Control (QC) Manager is responsible for independently confirming the project quality implementation. Confirmation includes inspecting and reviewing the work documentation to assess how effectively the QC Plan (Section 7) is being implemented.

The Project QC Manager has the authority to stop work if it is found to be noncompliant with contract specifications or project plans, and also has the authority to recommend corrective actions to the PM and to require that a schedule for corrective action implementation be established. The Project QC Manager may delegate specific QC responsibilities to the Site Superintendent, as appropriate.

The Project QC Manager has quality management as a principal duty, but may be assigned other duties when the level of quality management activities does not warrant full-time dedicated service and the other assigned duties do not conflict with the quality management duties. The Project QC Manager is the single point of contact responsible for ensuring compliance with the requirements identified in the contract and the QC Plan (Section 7). The Project QC Manager or designated alternate is responsible for reviewing and certifying overall quality management related to the construction work.

4.3. SITE SUPERINTENDENT

The Site Superintendent reports to the PM and is responsible for supervising implementation of all field activities. He or she provides direct supervision of field staff and, together with the SSHO and Project QC Manager, is responsible for ensuring that all personnel adhere to the requirements of the SSHP and QC Plan (Section 7). Subcontractors will also report to the Site Superintendent and act at his or her direction. The Site Superintendent has the authority to stop work if it is found to be noncompliant with contract specifications or project plans. The Site Superintendent will prepare the Daily Production Reports.

4.4. SITE SAFETY AND HEALTH OFFICER

The SSHO will be responsible for implementation and oversight of safety- and health-related aspects of the project. His or her responsibilities will include reviewing and approving the site-specific SSHP and providing additional safety and health direction and auditing as needed to ensure that the project meets contract requirements and provisions of 29 CFR OSHA 1910 (General Industry Standards) and OSHA

1926 (Construction Standards), in particular 1910.120/1926.65, Hazardous Waste Site Work and Emergency Response Standards. The SSHO is responsible for the following tasks:

- Evaluate each feature of work for safety and health risks
- Ensure that periodic safety audits are conducted
- Interpret air monitoring and air sampling data required to determine appropriate upgrade or downgrade of personal protective measures
- Ensure compliance with specified safety and health requirements, federal, state, and OSHA regulations, as well as pertinent aspects of the SSHP
- Conduct accident investigations and prepare accident reports
- Review results of daily QC inspections and document safety and health findings in the Daily Production Report or logbook as appropriate
- Recommend corrective actions in coordination with site management and the ERRG's Corporate HSM for identified deficiencies and oversee the corrective actions

The SSHO is authorized to stop work if unacceptable safety and health conditions exist and to take appropriate measures to reestablish and maintain safe working conditions. The SSHO may not change the SSHP or protocols without the approval of the ERRG's Corporate HSM and acceptance by the client, if appropriate.

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Section 5. Planned Removal Activities

This section describes the specific activities and procedures involved in preparation for and field implementation of the NTCRA at the Building 965 Area. The planned activities include:

- Mobilization and site preparation
- Removal of loose and flaking LBP from Building 969[2]
- ACM abatement in Buildings 965 and 969[2]
- Tree removal
- Building deconstruction
- Asphalt pavement and concrete removal
- Pre-excavation sampling (soil gas)
- Soil excavation
- Post-excavation confirmation sampling (soil)
- Backfill placement and compaction
- Waste classification, storage and disposal
- Post-excavation confirmation sampling (soil gas)
- Contingency actions (including installation of an SVE system)
- Demobilization
- Update existing risk assessment
- After Action Summary Report
- Letter requesting concurrence with NFA determination

5.1. MOBILIZATION AND SITE PREPARATION

To initiate field activities, all equipment and materials required for performance of the work will be mobilized to the site. In compliance with the City of Novato, regular site work hours for authorized construction activities have been established as 7:00 a.m. to 6:00 p.m. Monday through Friday (City of Novato, 2009), and activities will only be conducted during daylight. These work hours will be presented to community members and adjusted as necessary to ensure minimal impacts to nearby residents and workers during construction. Work performed outside of regular site work hours must be approved by

[2] Note: This task was completed prior to finalizing this RAWP.

appropriate Navy personnel. The following subsections detail the mobilization and site preparation activities.

5.1.1. Permitting and Notifications

This NTCRA is an on-site response action being performed pursuant to Comprehensive Environmental Response, Compensation, and Liability Act; therefore, per the NCP, the Navy is exempt from administrative permit requirements, such as permit fees. However, to fulfill the substantive requirements of the permit process, the following permits and notifications will be issued:

- The Navy will notify the Bay Area Air Quality Management District (BAAQMD) regarding the planned building demolition activities, and will document that any asbestos-containing building materials are handled in accordance with BAAQMD and OSHA requirements (see Section 5.1.6).
- The Navy will notify BAAQMD at least 5 days prior to planned excavation activities and document the mitigation measures proposed to comply with the substantive requirements of BAAQMD regulations regarding VOCs and fugitive dust emissions.
- ERRG maintains a current annual excavation permit from California OSHA (No. 2007-903620). The required 5-day notification will be provided before excavation activities begin.

Based on previous site surveys, excavation activities are not anticipated to affect archaeological resources. If any potential archaeological resources are observed in the excavation areas, work in the immediate area will be suspended and the Navy Resident Officer in Charge of Construction (ROICC) and Remedial Project Manager (RPM) will immediately be notified. Work in the area will only resume after express permission from the Navy RPM.

During the permit application process, the Navy ROICC and RPM will be consulted for review and assistance. Traffic routes for construction work will also be reviewed and revised, as necessary, prior to mobilization of resources.

5.1.2. Utility Identification, Clearance, Avoidance, and Protection

Prior to conducting subsurface drilling or excavation activities, ERRG will notify Underground Service Alert of Northern California at least 48 hours prior to any intrusive activities to locate publicly owned underground utilities. Many of the on-site utilities were owned by the Navy prior to base closure and may not be documented by the public utilities. As a result, an independent utility locating company will be subcontracted to perform geophysical surveys in the areas where subsurface work is expected (soil gas borings and excavation) and to provide backup to the utility identifications done by the public utilities. Finally, existing utility maps will be reviewed and compared with utility locations marked in the field. All utility identification and clearance activities will also be coordinated in advance with the Navy ROICC, Caretaker Site Officer (CSO), and RPM.

Utility lines encountered within 100 feet of the site boundary are assumed to be active, unless specifically determined to be inactive through consultation with the city of Novato and with the Navy ROICC and RPM. These utilities will be avoided to the extent practical and, when avoidance is not possible, will be protected in place. Some overhead utility lines and associated power poles are located within the proposed excavation area. These utility lines and power poles may be de-energized and removed (if necessary) prior to excavation activities. Overhead telecommunication lines are considered active and will be protected during site work.

Utility lines encountered greater than 100 feet from the site boundary are assumed to be inactive and part of the Navy-owned utility network. This assumption will be verified in advance with the City of Novato and with the Navy ROICC and RPM. Inactive utilities will be avoided to the extent practical and, when avoidance is not possible, will be cut and capped in place with cement grout and noted on field drawings and daily reports (for as-built documentation). Cutting and capping of inactive utilities will be coordinated with the City of Novato and with the Navy ROICC and RPM.

Contingency actions to be used if an unexpected utility line break occurs are discussed in Section 5.11.2.

5.1.3. Topographical Survey

Before any excavation-related work begins at the site, survey coordinates for the initial boundaries of the excavation, based on surveyed previous sample locations, will be located in the field. The survey will also note grade of the excavation area to ensure removal of a minimum of 1 foot below grade. After excavation activities are completed, a land survey will be performed to locate the final excavation boundaries and sample locations for the Building 965 Area. The required horizontal coordinates will be surveyed to the nearest 0.1 foot. The required vertical coordinates will be surveyed to the nearest 0.01 foot.

5.1.4. Work Areas and Site Security

Work areas will be established, as shown on Figure 5, to isolate removal activities from adjacent areas. A support zone will be established outside the work area for a portable sanitation facility and storage of equipment and supplies.

Security fencing will be installed around the NTCRA work area. Some of the existing fencing will likely be used; however, new fencing will be installed to secure the work area. Temporary fencing will be placed around the area where fence panels are to be removed along the western boundary fence, which separates the former DoDHF Novato and Lanham Village, to allow for sloping of the excavation area. Temporary fencing will also be placed around the Lanham Village garden area to prevent wildlife access.

5.1.5. Vegetation Clearing

Vegetation clearing will be required within the work area and will consist of removal of surface brush before excavation of soil and removal of brush along the western boundary fence. Several saplings and two large trees located on the Lanham Village property will be removed prior to excavation activities. Tree timber will be chipped and placed in the Lanham Village garden area for use as mulch. Other vegetation that is not suitable for use as mulch will be segregated and disposed of as green waste. Vegetation within or near the root zone will be removed and disposed of with the excavated soil.

5.1.6. Asbestos-Containing Material and Lead-Based Paint Abatement

During the development of this RAWP, an ACM survey was conducted by a Certified Asbestos Consultant and LBP chip testing was completed to ensure worker and public safety during building deconstruction activities. Friable ACM was identified in Building 965, and both friable ACM and LBP were identified in Building 969. Appendix C describes the ACM and LBP survey activities, materials sampled, sample results, and recommendations for abatement.

All ACM (friable and non-friable) designated for abatement was properly removed, containerized, and disposed of by a qualified ACM abatement subcontractor prior to finalizing this RAWP. ACM waste (friable) and nonhazardous ACM waste (non-friable) were containerized separately and properly disposed of at an off-site facility.

In addition, LBP was moistened and scraped off of all interior or exterior areas where paint is peeling, blistering, or stratified; properly containerized; and will be transported off site and disposed of in accordance with applicable regulations.

5.2. AIR MONITORING

Air monitoring will consist of direct-read instrumentation (i.e., Mini-Ram, Dust-trak, etc.) to measure total particulate concentrations within and adjacent to the work area, as well as Gastec detector tubes (Draeger tubes) and photoionization detector (PID) air monitoring to ensure that VOC concentrations in air do not exceed action levels for worker or public safety.

Dust monitoring (both along the perimeter of the work area and within the active work zone) will be performed immediately prior to and on an hourly basis during the following work activities:

- Building deconstruction
- Asphalt pavement and concrete removal
- Soil excavation
- Backfill placement and compaction

A perimeter total dust action level of 50 micrograms per cubic meter of air (measured as the difference between upwind and downwind stations) will be used during site activities. The action level is based on the California Air Resources Board's air quality standard for particulate matter (or PM-10) over a 24-hour period (California Air Resources Board, 2008). Concentrations exceeding the perimeter total dust action level will trigger implementation of additional engineering controls (i.e., application of water) in the work area to minimize off-site migration of dust.

Periodic air monitoring for VOCs will be conducted within and along the perimeter of the work zone to ensure that VOC concentrations are below action levels. The following air monitoring approach will be implemented daily:

- Background levels will be measured with the PID and recorded before any work commences (at the start of each workday).
- Monitoring within the work zone will be conducted with the PID to evaluate potential exposure of workers to COCs (1,3-butadiene, benzene, cis-1,2-dichloroethene, ethylbenzene, trichloroethene, and vinyl chloride).
- Perimeter monitoring will be conducted using a PID (ppbRAE Plus, or equivalent) at least three times daily.
- PID results will be compared with action levels by multiplying the correction factor (listed in the SSHP) for each COC by the concentration reading from the 10.6-electronvolt lamp PID. The action levels for each COC are one-half of the permissible exposure limit. The readings will also be compared with the background readings recorded at the start of each day.
- If action levels are exceeded in the work zone, or if background and action levels are exceeded at the perimeter, work will be stopped until concentrations are reduced. Draeger tubes and/or a 4-gas lower explosive limit meter will be used to establish which COCs are contributing most significantly and to evaluate whether additional engineering controls are required to safely proceed.
- The SSHO will determine if further actions or measurements are warranted to prevent or minimize exposure to personnel or the public.

It is not anticipated that project work activities will produce a volume of VOCs that would impact outdoor air and require action. BAAQMD Regulation 2 Permit, Rule 5 (Appendix D) provides for the review of new sources of toxic air contaminant (TAC) emissions to evaluate potential exposure of the public and to mitigate potentially significant health risks resulting from these exposures. An exemption to the provisions of this rule is provided for sources where the increase in each TAC emission is below a contaminant-specific acute trigger level, which represents an air concentration that is not likely to cause adverse effects to human health. In 2008, Battelle used this rule along with the potential TACs at the site to establish contaminant-specific acute trigger levels and evaluate the applicability of the BAAQMD Regulation 2 Permit Rule 5 (Battelle, 2008). The following assumptions were made in calculating the acute trigger levels:

- Soil excavation volume: 800 cubic meters
- All soil will be excavated in 1 hour (this is overly conservative, given that the proposed excavation will last for several days)
- All of the soil gas contained within excavated soil will be released during excavation
- A soil-air porosity of 0.5

The calculated emission rates (presented in Appendix D), based on these conservative assumptions, are several orders of magnitude below the BAAQMD acute trigger levels. This calculation indicates that the mass of soil gas present in the subsurface is not significant enough to result in emissions to the air at levels that would result in health risks to site workers or nearby residents.

Also, DTSC granted this site a general rule exemption, "With Certainty, No Possibility of a Significant Environmental Effect for the following reasons: (1) all aspects of the project are designed to eliminate opportunities for exposure, (2) in June 2008, the BAAQMD reviewed the projected TAC emissions from the proposed excavation at the site and determined the emissions, would be low and pose insignificant health risks…" (DTSC, 2009).

5.3. BUILDING DECONSTRUCTION

As part of the NTCRA, aboveground structures are intended to be dismantled and removed at the Building 965 Area (Figure 6). Any active utilities will be disconnected, all material from inside the buildings will be cleared, and all mechanical features of the buildings will be removed prior to deconstruction. The buildings will be deconstructed with an excavator and stockpiled for transport and disposal as non-hazardous construction debris, pending facility acceptance. Sufficient water will be used for dust suppression during all building deconstruction activities and care will be taken to avoid runoff from the work area.

5.4. ASPHALT PAVEMENT AND CONCRETE REMOVAL

The area surrounding Building 965 is covered with either asphalt pavement or concrete. Asphalt pavement and concrete will be removed from within the excavation footprint and surrounding areas (Figure 6) and stockpiled separately from potentially contaminated soil. All asphalt pavement and concrete will be transported to an off-site facility for recycling based on facility acceptance criteria.

5.5. PRE-EXCAVATION SAMPLING

Following site preparation, five soil gas samples will be collected from five locations to evaluate the immediate effects of removing the asphalt pavement and concrete slab and to provide additional data for the existing risk assessment. The proposed locations for collection of pre-excavation soil gas samples are shown on Figure 7, and the sampling locations and rationale are summarized in Table 2. Soil gas samples will be collected from fixed monitoring points to be installed via direct-push drilling. All soil gas samples will be analyzed for VOCs by U.S. Environmental Protection Agency (EPA) Method TO-15 (EPA, 1999). Soil gas sampling procedures are outlined in the SAP (Appendix A)[3].

Table 2. Pre-Excavation Soil Gas Sampling Locations and Rationale

Location ID No.	Proposed Depth (feet bgs)	Sampling Rationale
PSG-1A-1, northeast of Building 965, collocated with SG-1A-16	4 to 6	Evaluate and delineate ethylbenzene concentration
PSG-1A-2, underneath Building 965	4 to 6	No samples were collected underneath this building during past sampling events
PSG-1A-3, west of the wash pad at property boundary	4 to 6	No soil gas samples were collected on the boundary of Navy and Lanham Village during past sampling events
PSG-1A-4, collocated with ESG-9	4 to 6	Evaluate VOC concentrations in soil gas where inconsistent data exist
PSG-1A-5, collocated with ESG-11	4 to 6	Evaluate VOC concentrations in soil gas where inconsistent data exist

5.6. SOIL EXCAVATION

ERRG will remove, classify, and dispose of subsurface soil at the Building 965 Area. The area proposed for excavation is under the wash pad footprint (less than 2,000 square feet) to approximately 10 feet bgs (just above the water table) (Figure 6). The excavation will be sloped on all sides to ensure the integrity of the excavation walls and surrounding ground surface and to protect workers and surrounding utilities and structures against cave-ins. The excavation volume is anticipated to be less than 900 bank cubic yards.

Lanham Village Homeowners Association granted the Navy access to their property to properly slope the excavation. The area of the sloped excavation that encompasses Lanham Village property is approximately 600 square feet. The Navy will provide the Lanham Village Homeowners Association notification of the commencement of excavation activities at least 14 days prior to subsurface work. Excavation activities will be completed within 30 days (Lanham Village Homeowners Association, 2009).

[3] Although the SAP specifies six primary VOCs to be analyzed (benzene, 1,3-butadiene, cis-1,2-dichloroethene, ethylbenzene, trichloroethene, and vinyl chloride), a full suite of VOCs will be requested on the chain of custody. The six primary VOCs will be used during initial screening of soil gas concentrations to satisfy the project data quality objectives developed in the SAP (Appendix A). The full suite of VOCs will be evaluated in the risk assessment update (see Section 5.13).

ERRG will use a mechanical excavator to remove subsurface soil under the wash pad down to the water table (approximately 10 feet bgs). ERRG will check the depth during soil removal activities. As materials are excavated, a field technician will remain in direct line of sight with the excavator operator to guide operations. Field technicians will be trained to perform the required work for the project. Soil will be stockpiled on 10-mil polyethylene sheeting near the excavation area, surrounded by soil berms (to control runoff), and covered with polyethylene sheeting at the end of each work shift. Soil stockpiles will be constructed and maintained in accordance with the staging pile requirements at 40 CFR § 264.554(d)(1)(i–ii) and (d)(2), (e), (f), (h), (i), (j), and (k).

Soil over-excavated to achieve the cut-back slopes will be stockpiled separately from the soil excavated beneath the pad and will be analyzed for VOCs for potential reuse as backfill material (one discrete sample per 100 cubic yards). Analytical results will be compared with EPA Region 9 regional screening levels (RSLs) for residential soil to determine whether VOCs are present in soil at unacceptable levels. Soil sampling procedures for stockpiled soil for potential use as backfill will comply with the requirements for soil confirmation sampling outlined in the SAP (Appendix A). If stockpiled soil from the slope cut areas contains contamination or is structurally unsuitable, it will be disposed of off site. Stockpiled soil for off-site disposal will be characterized in accordance with the procedures presented in Section 6.1.

ERRG will collect confirmation soil samples from the excavated area as described in Section 5.7. Soil sampling procedures are described further in Sections 5.7 and 5.9 and detailed in the SAP (Appendix A).

5.6.1. Migration Control Measures

Any sediment potentially transported off site by wind or water erosion would originate primarily from areas disturbed by vehicular and heavy equipment usage and trucks. Best management practices (BMPs) used to reduce the potential for migration include dust control (i.e., by spraying water), ensuring that heavy equipment is adequately decontaminated before leaving the work area, and sweeping at the entrance and exit to each site.

Dust generation is anticipated to be minimal, but may require that water be sprayed during site activities. Over-watering, which could result in runoff, will be avoided. Dust control measures will be recorded daily on the field log forms. Dust monitoring will be performed during building deconstruction and soil excavation activities; dust monitoring procedures are summarized in Section 5.2.

Paved areas within 50 feet adjacent to the entrance and exit point (i.e., contaminant reduction zone shown on Figure 5) will be maintained by manual sweeping during active site operations throughout the duration of the project. This practice will minimize dust generation during dry periods and sediment discharge into adjacent areas during potential rain events. Sweepings collected at the entrance and exit points will be placed on existing soil stockpiles on site.

5.6.2. Spill Prevention and Control Measures

ERRG personnel are trained to contain and control minor spills. A hazardous materials spill kit, including an 85-gallon polyethylene overpack, clay absorbent material, spill booms, absorbent pads, and shovels, will be kept readily available at the project site. Emergency contact numbers to be used if a spill occurs are presented in the SSHP (included as an appendix to the APP [ERRG, 2009]).

If a minor spill occurs, ERRG personnel will promptly contain and clean the spill using the following procedures:

- If the spill occurs on paved or impermeable surfaces, it will be cleaned up using "dry" methods (i.e. absorbent pads or other material and rags).
- If the spill occurs in a dirt area, it will be contained by constructing an earthen dike, digging up the affected soil, and placing the soil in a stockpile for disposal.
- If the spill occurs during rainy weather, the affected area will be covered to minimize surface runoff from the area.

Examples of minor spills include diesel fuel spilled during fueling operations and a vehicle accident in which the gas tank is ruptured. If a major spill occurs, ERRG personnel will initiate emergency response notifications, as listed below in Table 3.

Table 3. Notification List for Major Spills

Organization	Phone Number
National Response Center	(800) 424-8802
California Office of Emergency Services	(800) 852-7550
U.S. Environmental Protection Agency Region 9 spill phone	(415) 947-4400
Novato Fire Department	(415) 892-1511
Novato Community Hospital	(415) 209-1300

5.7. POST-EXCAVATION CONFIRMATION SAMPLING (SOIL)

Following excavation activities, ERRG will collect additional soil samples to confirm that VOC-contaminated soil has been removed, and that the RAO "to reduce and/or manage human health risk at the site to acceptable levels" (Battelle, 2009a) has been achieved.

In total, 10 soil confirmation samples will be collected from the excavation (between the bottom and the sidewalls (Figure 8). The soil samples will be collected from discrete locations between the ground surface and approximately 8 feet bgs that are representative of both the upper 5 feet (relatively high-permeability material) and the underlying (less permeable) material. Analytical results will be compared with RSLs for residential soil to determine whether VOCs remain in soil at unacceptable levels. If concentrations of VOCs in soil are above RSLs, additional soil will be excavated until confirmation samples indicate VOCs are less than RSLs. Soil sampling procedures are outlined in the SAP (Appendix A).

5.8. BACKFILL PLACEMENT AND COMPACTION

Backfilling will commence upon receipt of acceptable confirmation sampling results. The backfill material will consist of compacted structural fill from the bottom of the excavation to within 18 inches of the ground surface; the remaining portion of the excavation will be backfilled with class 2 aggregate base material. Any topsoil removed from the portion of the excavation that extends onto property owned by Lanham Village will be replaced with an equivalent amount of topsoil of equal or higher quality to the soil that is removed (Lanham Village Homeowners Association, 2009). All backfill material will be analyzed for site COCs and various chemicals, as recommended in a DTSC advisory (DTSC, 2001), and compared against regulatory acceptance criteria. Table 4 summarizes the analyses to be performed and acceptance criteria. The backfill sampling approach is outlined in the SAP (Appendix A).

Table 4. Analyses and Acceptance Criteria for Soil Backfill

Analytical Group	Analysis Method	Acceptance Criteria
Total metals (list of 17 metals per California Assessment Manual)	EPA Method 3050B and 6010B/7471A	Background concentrations[1] or EPA RSLs[2]
Asbestos	Polarized light microscopy	EPA RSLs[2]
pH	EPA Method 9040	
Polychlorinated biphenyls	EPA Method 8082	EPA RSLs[2]
Total petroleum hydrocarbons for diesel and motor oil	EPA Method 8015B	SFRWQCB ESLs[3]
Semivolatile organic compounds	EPA Method 8270	EPA RSLs[2]
VOCs	EPA Method 8260B	EPA RSLs[2]

Notes:

1. Background concentrations of metals in soil from the “Final Environmental Baseline Survey Sampling and Analysis Screening Level Report” for the Former DoDHF Novato, dated April 15, 1997. Background metals concentrations will be used as acceptance criteria for metals where the background concentration is greater than the EPA Region 9 RSL.
2. EPA Region 9 RSL for residential use (EPA, 2009).
3. San Francisco Regional Water Quality Control Board (SFRWQCB) environmental screening level (ESL) (SFRWQCB, 2008).

The backfill will be placed in 8-inch loose lifts, and will be compacted to 95 percent of the maximum dry density (as determined by ASTM Method D1557) (ASTM International, 2009a). Relative compaction will be tested using a compaction density gauge (in accordance with ASTM Method D6938) (ASTM International, 2009b). The final surface shall be graded to prevent ponding of surface water, with drainage consistent with local topography. ERRG will subcontract a California-licensed land surveyor to document the excavation boundaries and post-excavation topography.

5.9. WASTE CLASSIFICATION, STORAGE, AND DISPOSAL

Excavated soil not intended for backfill will be temporarily stockpiled on site until laboratory analyses confirm the waste classification for the soil. BMPs will be used to minimize potential effects in and around the stockpile areas, including (1) covering soil stockpiles at the end of each workday and during windy or wet conditions, (2) installing a decontamination area with runoff controls, and (3) implementing good housekeeping practices. If an unseasonable lengthy storm occurs, straw wattle may be used to help slow the velocity of surface water moving across the site, thus preventing potential soil erosion. As described in Section 5.6.1, heavy equipment entering and exiting the site will be inspected and decontaminated to ensure that no soil is tracked onto public roadways around the entrance and exit gates of the site. After soils have been properly characterized, they will be transported to an off-site disposal facility, as presented in Section 6.

Soil stockpile samples will be analyzed to determine the waste classification of soil for disposal purposes (i.e. non-Resource Conservation and Recovery Act [RCRA]-hazardous [commonly referred to as California-hazardous] and nonhazardous). Four-point composite samples will be collected every 500 cubic yards from the stockpile and analyzed for Title 22 California Code of Regulations requirements and other analyses as required by the specific disposal facility. Based upon the results of these analyses, California waste extraction test[4] (WET) and toxic characteristic leaching procedure[5] (TCLP) analyses may be required for selected chemicals to meet the disposal facility requirements. In general, if a chemical concentration is 10 times greater than the soluble threshold limit concentration (STLC) or total threshold limit concentration (TTLC), a WET will be performed for that chemical. If the chemical concentration exceeds criteria for WET, then the TCLP will be performed. Also, a TCLP will be performed if a chemical concentration is 20 times greater than the STLC or TTLC.

Front-end loaders will transfer soil from the stockpile to dump trucks for transport and disposal after the stockpile has been analyzed and the waste is characterized. Each load of waste will be manifested based on the waste classification results. Waste transportation and disposal is discussed in detail in Section 6.

5.10. POST-EXCAVATION CONFIRMATION SAMPLING (SOIL GAS)

Following excavation backfill and site restoration, ERRG will collect 44 additional soil gas samples from within and outside the excavation footprint to ensure that any residual VOC concentrations detected in soil gas are below the risk-based screening levels (RBSLs) developed in the EE/CA (Battelle, 2009a) and that no continuing source of soil gas contamination is present[6]. Twenty-two samples will be collected from 11 locations 30 days after the site has been backfilled with clean soil. Twenty-two additional

[4] Determine if the waste is California-hazardous

[5] Determines if a waste is RCRA-hazardous

[6] RBSLs are intended for data screening purposes and will be used as preliminary decision criteria for the NTCRA. Final decisions on the need for additional action or site closure will be made following completion of the risk assessment update that will include all existing soil gas data for this site.

samples will be collected from the same locations as the first round of post-excavation soil gas confirmation samples, 90 days after the site has been backfilled with clean soil. Figure 9 shows the proposed locations where post-excavation confirmation soil gas samples will be collected. Samples will be collected from depths consistent with the depth intervals where samples were collected during the May 2008 preliminary sampling event for the Building 965 Area. Table 5 summarizes the sampling locations, proposed sample depths, and rationale for the samples collected. Soil gas samples will be collected from fixed monitoring points to be installed via direct-push drilling. All samples will be analyzed for VOCs by EPA Method TO-15 (EPA, 1999).

5.11. CONTINGENCY ACTIONS

The following subsections outline response procedures for several contingency actions that may occur during the implementation of the NTCRA.

5.11.1. Unpredicted Inclement Weather

The NTCRA is being performed during months normally associated with relatively moderate to low precipitation; however, the possibility exists for severe weather conditions. ERRG, in coordination with the Navy ROICC representative and the RPM, may modify erosion control measures if an unusually large storm event occurs. Special provisions may include such measures as berms to divert runoff water and placement (and anchoring) of liner materials within excavations.

5.11.2. Utility Line Breaks

As discussed in Section 5.1.2, care will be taken to ensure that potential utility lines are not breached. If a utility line is accidentally broken, project personnel will take emergency action to stop or control the flow at the source, if it is safe to do so, and notify the Site Supervisor of the incident. Upon being notified of a utility line break, the supervisor will notify the Navy ROICC representative and RPM and will assume command of the control, containment, and cleanup operations and initiate the following actions:

- Confirm that injured personnel, if any, have been attended to and arrange for necessary medical assistance and transport to hospitals.
- Confirm that personnel have been assigned to stop or control the flow of water or wastewater and secure any leaks, if it can be done safely.
- Assess the break and damage and evaluate site safety and other parameters such as spill volume, potential threats to the public, extent, and direction of movement.
- Notify the site oversight personnel as provided in the emergency contact list. Notify emergency services if a threat to the public exists and a significant spill leaves secondary containment. Notify the appropriate state and local agencies.
- Initiate containment and cleanup efforts.

Table 5. Post-Excavation Confirmation Soil Gas Sampling Locations, Proposed Sample Depths, and Rationale

Location ID No.	Proposed Sample Depths (feet bgs)	Sampling Round	Sampling Rationale
CSG-1A-1, North of Excavation	3.0 – 3.5 6.0 – 6.5	Round 1 (30 days after excavation backfill) and Round 2 (90 days after excavation backfill)	Confirm VOC concentrations are less than RBSLs
CSG-1A-2, Collocated with PS-1A-1	3.5 – 4.0 6.0 – 6.5	Round 1 and Round 2	Confirm VOC concentrations no longer exceed RBSLs
CSG-1A-3, Collocated with PS-1A-2	3.0 – 3.5 9.0 – 9.5	Round 1 and Round 2	Confirm VOC concentrations no longer exceed RBSLs
CSG-1A-4	3.5 – 4.0 6.0 – 6.5	Round 1 and Round 2	Confirm VOC concentrations are less than RBSLs
CSG-1A-5, Collocated with PS-1A-7	3.5 – 4.0 6.0 – 6.5	Round 1 and Round 2	Confirm VOC lesson longer exceed RBSLs
CSG-1A-6	3.0 – 3.5 6.0 – 6.5	Round 1 and Round 2	Confirm VOC concentrations are less than RBSLs
CSG-1A-7	3.0 – 3.5 6.0 – 6.5	Round 1 and Round 2	Confirm VOC concentrations are less than RBSLs
CSG-1A-8, collocated with PS-1A-5	3.5 – 4.0 7.0 – 7.5	Round 1 and Round 2	Confirm VOC concentrations no longer exceed RBSLs
CSG-1A-9	3.0 – 3.5 6.0 – 6.5	Round 1 and Round 2	Confirm VOC concentrations are less than RBSLs
CSG-1A-10, collocated with PS-1A-3	3.5 – 4.0 6.0 – 6.5	Round 1 and Round 2	Confirm VOC concentrations no longer exceed RBSLs
CSG-1A-11	3.0 – 3.5 6.0 – 6.5	Round 1 and Round 2	Confirm VOC concentrations are less than RBSLs

Note: Sampling locations and depths may be adjusted between Round 1 and Round 2 sampling, if warranted based on analytical results from Round 1.

5.11.3. Soil Vapor Extraction System

This is an optional SOW item that will be implemented to meet the RAO if prior removal activities and land use controls alone will not be suitable to protect human health and the environment from the vapor intrusion pathway. If implementation of this optional SOW item is determined to be necessary, an amendment to this RAWP will be prepared to outline installation, operation, and shutdown procedures for the SVE system. The contingency decision-making process will specifically consider whether the SVE system can achieve appreciable reductions in risks from potential exposure to vapors to levels below 1×10^{-6}, and whether residual concentrations of VOCs in soil gas can be effectively managed using institutional controls requiring vapor barriers or other vapor management technologies. If it is concluded that institutional controls cannot effectively manage residual risk and SVE could achieve appreciable reductions in risk in the area (e.g., more than an order of magnitude) while bringing them below 1×10^{-6}, then the contingency SVE system would be installed and operated. Details regarding criteria for operation and shutdown of the SVE system are documented in the EE/CA (Battelle, 2009a).

5.12. DEMOBILIZATION

After completion of all work elements, disturbed areas will be graded to pre-construction conditions. ERRG will perform a thorough site inspection at the end of the project fieldwork to ensure that all trash and construction materials have been removed from the site.

5.13. UPDATE EXISTING RISK ASSESSMENT

Following receipt of analytical results from all of the samples collected during the field activities, the existing risk assessment will be updated based on the findings of the NTCRA and other historical site characteristics. The update will be conducted to support ongoing risk management decisions at the site and ensure that no unacceptable risk is posed to human health or the environment. Details regarding the risk assessment methodology are provided in the risk assessment white paper (Battelle, 2009b).

5.14. AFTER ACTION SUMMARY REPORT

ERRG will prepare an After Action Summary Report (draft and final) that documents the activities performed, including drawings documenting the final excavation boundaries and a summary of waste characterization and disposal activities. Supporting documentation, including waste manifests, waste characterization results, and other supporting documentation, will be included as attachments to the report. The report shall also include submittal of georeferenced data documenting the extent (vertical and horizontal) of the soil excavation from a California-licensed land surveyor.

5.15. NO FURTHER ACTION LETTER

ERRG will prepare a letter summarizing the pertinent post-excavation site conditions and requesting regulatory agency concurrence with a NFA determination for the Building 965 Area. The letter will summarize the project background, the results of previous investigations, the results of the post-excavation soil gas data, and the updated risk assessment.

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Section 6. Waste Management Plan

Five types of waste will be generated during the field event performed per this plan:

- Asbestos and LBP containing materials
- General construction debris (piping, metal, and wood)
- Asphalt pavement and concrete
- Excavated soils
- Disposable sampling equipment and personal protective equipment (PPE)

As waste is generated, it will be classified, labeled, managed, and disposed of in accordance with the requirements of 40 CFR Chapter I, § 260.11and 22 California Code of Regulations § 66261.24, and any other applicable state and federal regulations. The soil will be shipped as either Class I California-hazardous waste or Class II nonhazardous waste, and will be tracked using nonhazardous waste manifests. The waste classification will be made after soil has been characterized by ERRG and profiled by the disposal facility. It is anticipated that 50 percent of the excavated soil will be Class I California-hazardous waste and 50 percent will be Class II nonhazardous waste. The asbestos containing materials will be disposed of as either hazardous waste for friable asbestos or nonhazardous solid for non-friable asbestos. Table 6 lists the proposed disposal facilities for each anticipated waste.

Table 6. Proposed Waste Disposal Facilities

Disposal Facility	Waste Classification	Waste Type
Waste Management Kettleman Hills Facility, Kettleman City, CA	Class I California-hazardous waste	Soil
	Hazardous waste LBP	LBP
Norcal Waste Systems Hay Road Landfill, Vacaville, CA	Class II nonhazardous waste	Soil
	Construction debris	Piping, metal, and wood debris
	Hazardous waste friable asbestos	Friable asbestos
	Non-hazardous waste / non-friable asbestos	Non-friable asbestos
Nor-Cal Rock, Inc. Oakland, CA	Recyclable asphalt pavement and concrete	Asphalt pavement and concrete

All wastes will be transported to the appropriate facilities by Denbeste Transportation, Inc. All manifests, when applicable, shall be signed by the Navy ROICC or CSO representative. Original copies of the manifests, along with associated laboratory analytical reports, will be submitted to the Navy ROICC or CSO representative within 7 days after disposal. Certificates of final disposal from Waste Management and Norcal Waste Systems and weight tickets from Nor-Cal Rock, Inc. will be provided in the After Action Summary Report.

6.1. EXCAVATED SOIL

Approximately 900 bank cubic yards of soil will be excavated from the site. The soil will be stockpiled within the footprint of Building 969 (following deconstruction of the building) and in accordance with the erosion control measures described in Section 5.6.1. Four soil samples will be collected from each segregated waste and will be submitted to an approved laboratory for analysis per the appropriate landfill facility's permit requirements for disposal of VOC-contaminated soil, as described below.

- VOCs (EPA Method 8260B [EPA, 2008])
- California Assessment Manual 17 Metals (EPA Method 6010B/7470/7471 [EPA, 2008])

If deemed necessary, up to two samples will also be analyzed for the following:

- Semivolatile organic compounds (EPA Method 8270D [EPA, 2008])
- Organochlorine pesticides (EPA Method 8081B [EPA, 2008])
- Polychlorinated biphenyls (EPA Method 8082A [EPA, 2008])

Upon completion of profiling, soil will be loaded into trucks for transport to either Waste Management Kettleman Hills Landfill Facility in Kettleman City, California, for Class I California-hazardous waste disposal; or Norcal Waste Systems Hay Road Landfill in Vacaville, California, for Class II nonhazardous waste disposal. The excavated material will be transported off site using the truck route exiting the site as shown on Figure 5.

ERRG will maintain a dedicated Transportation Coordinator on site during scheduled load-out operations. The Transportation Coordinator will be responsible for directing trucks to and from the project site, including signage and flagging as necessary. An appropriate number of trucks will be dispatched to the site upon completion of waste characterization.

The driver of each truck will provide direction to the Transportation Coordinator to determine when his or her truck is loaded to capacity. Drivers will use existing air gauges on their vehicles to approximate the loaded weight of the bin(s). The approximate weight will be communicated to the Transportation Coordinator to determine if any adjustments are required before departing to the disposal facility.

Once loaded, the truck will be moved to an on-site area to undergo dry decontamination and tarping before departing the site. The truck dry decontamination and tarping will be performed in the contaminant reduction zone shown on Figure 5. At the dry decontamination area, the tires will be brushed to remove loose soil or debris, and the doors and tarp will be inspected to ensure proper security. The doors and tarp will remain in place throughout the trip to the off-site waste disposal landfill.

ERRG staff will confirm that all necessary procedures are conducted at the final staging area prior to providing the driver with the appropriate shipping papers for transport to the disposal facility. Truck load-out inspection and shipping papers will be maintained in the on-site project file.

6.2. DISPOSABLE SAMPLING EQUIPMENT AND PERSONAL PROTECTIVE EQUIPMENT

If, based on the best professional judgment of the field manager, PPE and disposable sampling equipment can be rendered nonhazardous after decontamination procedures, such equipment will be collected in double plastic bags and disposed of off site as municipal waste. Equipment that is potentially contaminated will be stored in drums, labeled, inventoried, and disposed of as California-hazardous waste. The waste materials generated in the support zone are considered non-investigation-derived waste trash and will be disposed of as municipal waste.

6.3. GENERAL CONSTRUCTION DEBRIS

General construction debris, such as piping, metal, wood, caution tape, etc., will be disposed of at the Norcal Waste Systems Hay Road Landfill in Vacaville, California. This material will be stockpiled on site for off-site transportation and disposal.

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Section 7. Quality Control Plan

The ERRG quality management system consists of plans, procedures, and the organization necessary to produce an end product that complies with governing regulations and the contract requirements. This Construction Quality Control Plan (CQCP) is based on the ERRG Contractor Quality Management Plan for Environmental Remediation Services (ERRG, 2008), which describes the basic program applied to all ERRG Environmental Multiple Award Contract (EMAC) projects and it is based on the Department of Defense Unified Facilities Guide Specifications 01451A, Contractor Quality Control.

7.1. PURPOSE OF THE CONSTRUCTION QUALITY CONTROL PLAN

This CQCP provides the mechanism to ensure that remediation project activities affecting quality are recorded within a document control system and are accomplished in accordance with contract specifications, drawings, and procedures. The CQCP outlines the system for inspections, tests, and controls necessary to achieve specified quality and identifies personnel, procedures, controls, instructions, tests, records, and forms to be used. This plan is subject to change based on review and implementation of additional tasks. Unforeseeable site conditions or changes in the work scope may warrant the revision of this plan or the addition of supplements to cover emergent work requirements.

7.2. QUALITY CONTROL ORGANIZATION

A central element for controlling quality is to establish a QC organization that is responsible for implementation of the procedures outlined in the CQCP; specifically, for observing, measuring, recording, and documenting the work performed and for controlling the quality by providing timely feedback to those persons actually performing the work. Feedback, in the form of documented inspections, tests, or other evaluations, is necessary to provide approval or disapproval of an activity based on pre-selected standards. Work that is disapproved must be corrected, redone, or reworked before subsequent work can be implemented.

The primary functions of the QC organization are to ensure that work is completed within the project requirements, without deficiency, and to the satisfaction of the client. To that extent, the focus of the QC organization is to ensure that staff with adequate and appropriate qualifications and training, as well as the appropriate procedures, are in place from the inception of the project through its completion.

The QC personnel will implement a three-phase control system for each definable feature of work (DFOW) performed (i.e., preparatory, initial, and follow-up phases). A fourth and final (i.e., completion) phase with inspections will also be conducted. Safety is equal in importance and is given equal emphasis with quality and production for each phase of every construction activity.

The project organization includes representatives from the Navy and ERRG. The responsibilities of key personnel within these organizations are discussed below.

7.2.1. Navy Team

The positions and responsibilities of the Navy project management are as follows:

- **Contracting Officer (CO)** – Responsible for negotiation and execution of the construction contract. The CO is responsible for providing contractual direction to ERRG.
- **RPM** – Provides governmental oversight of technical issues for the project. Interfaces with the community representatives and the contractor to meet project objectives.
- **ROICC** – Coordinates all work that takes place at the site. Specific tasks include approving vendor submittals, verifying personnel qualifications, conducting constructability reviews, and overseeing construction.
- **Quality Assurance (QA) Officer** – Responsible for government oversight of the QA program and provides quality-related direction for the project. Has authority to suspend project activities if the contract quality requirements are not met.

7.2.2. Remedial Action Contractor

ERRG is the remedial action contractor for the project. The positions and responsibilities of key ERRG personnel are as follows:

- **Program QC Manager** – The Program QC Manager is responsible for developing the QC process and supervising audits within the EMAC program for compliance with program and project specific procedures and specifications.
- **PM** – The PM has overall responsibility for the day-to-day management of projects, budgets, staffing, scheduling, execution of tasks and subcontractors, and deliverables.
- **Project QC Manager** – The Project QC Manager is responsible for managing and implementing the QC process for this NTCRA. The Project QC Manager reports to the Program QC Manager and is responsible for managing, coordinating, and certifying the three phases of control and documentation performed by the QC specialists, testing laboratory personnel, and any other inspection and testing personnel required for the NTCRA. An alternate Project QC Manager may be identified for specific tasks, as appropriate.

- **SSHO** – The SSHO is responsible for establishing and maintaining communications with all site personnel concerning the SSHP, verifying adherence to site safety requirements, organizing and conducting safety meetings (tailgate meetings), and recording and documenting safety incidents on site.
- **Site Superintendent** – The Site Superintendent is responsible for day-to-day supervision of staff and coordination of tasks for project completion. This includes review of engineering design documents, planning and oversight of field activities, documenting daily field production, and participating in QC meetings.

7.2.3. Meetings

Pre-Construction Meeting/Formal Site Visit

A pre-construction meeting and site visit will be conducted prior to initiation of field activities. The pre-construction meeting will be attended by personnel from the Navy, and ERRG's PM, Site Superintendent, SSHO, and Project QC Manager. Meeting minutes will be generated and distributed within 5 days of the meeting to participants. Meeting minutes will be filed with the project files and the Navy's administrative record, as required under Naval Facilities Engineering Command Southwest Division, Environmental Work Instruction #4 (Navy, 2007).

Progress Team Meetings

In the course of project execution, ERRG will attend project team meetings with Navy personnel, stakeholders, and other contractors to coordinate and schedule all work.

At these meetings, the look-ahead schedule will provide anticipated activities for review and planning. The meetings will enable ERRG and the Navy to work together as partners and discuss issues regarding work in progress or work planned. The meetings will include discussions of draft and final deliverables. ERRG's PM, Site Superintendent, and other project staff as necessary will attend these meetings.

ERRG will prepare the meeting agenda and distribute copies to all participants 48 hours in advance. ERRG will take the meeting minutes and submit a copy to the Navy within 10 calendar days.

Other Meetings

During construction, weekly progress/QC meetings will be held on site between ERRG and the Navy. ERRG's attendees will, at a minimum, include the Site Superintendent, Project QC Manager, and SSHO. In these meetings, ERRG will provide updates on the construction progress using as-built site drawings, and discuss the Request for Information status and schedule updates. Meeting minutes will be provided to the Navy within 10 calendar days.

7.2.4. Readiness Review

The RPM, the ROICC, and ERRG will conduct readiness reviews prior to start of any DFOW to ensure the following:

- All applicable permits have been obtained and notifications completed
- Adequately trained individuals will perform the work
- Appropriate plans and procedures are in place
- Adequate, calibrated equipment is available
- All other requirements for satisfactory performance have been met

The readiness review will serve as the preparatory phase inspection for each DFOW.

7.3. DEFINABLE FEATURES OF WORK

For this project, a list of the DFOW identified by trade and discipline has been projected as follows:

- Removal of loose and flaking LBP[7]
- ACM abatement[7]
- Building deconstruction
- Asphalt pavement and concrete removal
- Soil gas sampling
- Soil excavation
- Backfill placement and compaction

ERRG will implement an inspection procedure for the Three Phases of Control System for each DFOW performed (i.e., preparatory, initial, and follow-up phases) as discussed in Section 7.4. Preparatory, initial, and follow-up inspections will be completed for each of the DFOWs listed above.

A fourth and final or "completion" inspection will also be conducted. Safety is equal in importance and is given equal emphasis with quality and production for each phase of every construction activity.

7.4. CONTROL PHASES AND INSPECTIONS

The QC procedures for fieldwork are based on the three phases of quality control and inspections that consists of the following control phases:

[7] Note: This DFOW was completed prior to finalizing this RAWP.

- Preparatory Phase
- Initial Phase
- Follow-up Phase

In addition to the three phases of quality control, completion inspections will be also conducted. Each QC phase is discussed separately in the following subsections.

7.4.1. Preparatory Phase

A Preparatory Phase Inspection will be performed prior to beginning any work on each DFOW. The preparatory inspection will include the following activities:

- Schedule the Preparatory Phase meeting and inspection and notify the CO at least 48 hours in advance of the Preparatory Phase meeting.
- Attendees: Record attendees present at the meeting.
- Submittals: Verify that submittals for materials and equipment have been submitted and approved. Verify that approved materials are on hand (if not, document items missing). Verify approved submittals against delivered materials.
- Material Storage: Verify that materials are stored properly. If not, described the action that was taken.
- Preliminary Work and Permits: Ensure the preliminary work, permits, and notifications are on file. If not on file, document action taken.
- Testing: Identify tests to be performed, frequency, and by whom; when and where tests are required; review the testing plan and log; ensure that test facilities has been approved.
- Safety: Review the Activity Hazard Analyses and ensure they have been approved; review applicable portions of EM 385-1-1.
- Meeting Comments: Document Navy RPM or ROICC comments during the meeting.
- Other Items or Remarks: Document other items or remarks.

The ROICC and Navy RPM will be notified at least 48 hours prior to the start of the Preparatory Phase Inspection. The meeting will be conducted by the QC Manager and attended by appropriate QC personnel and the work leader(s) responsible for the DFOW.

Additional preparatory phases may be conducted on the same DFOW as determined by the Navy if the quality of ongoing work is unacceptable; or if there are changes in the applicable QC personnel or in the on-site production supervision or work crew; or if work on a DFOW is resumed after a substantial period of inactivity; or if other problems develop.

7.4.2. Initial Phase

An Initial Phase Inspection will be performed at the beginning of a DFOW. The initial phase inspection is performed to establish the level of workmanship and compliance with contract requirements for workmanship, materials, and tests. This inspection will include checking that preliminary workmanship is in compliance with the contract documents and the following items:

- Notification: document that notification was given to the ROICC and RPM.
- Personnel Present: document personnel, position, and company/agency affiliation.
- Procedure Compliance: identify full compliance with procedures identified at preparatory phase; coordinate plans, specifications, and submittals.
- Preliminary Work: ensure preliminary work is complete and correct; if not document action taken.
- Workmanship: establish the level of workmanship and where the work is located; verify if a sample panel is needed or not.
- Resolution of Differences: document differences and the resolution; note comments.
- Safety: review job conditions using EM-385-1-1 and the job hazard analysis; record comments.
- Other: document any other conditions or comments.

The project QC Manager will conduct the inspection; appropriate QC personnel, work leader(s), and field crew responsible for the executing the work will perform the workmanship.

The initial phase will be repeated for each new crew to work on site or any time acceptable specified quality standards are not being met or are revised.

7.4.3. Follow-Up Phase

The Follow-Up Phase is performed daily to ensure continued compliance with the level of workmanship established in the Initial Phase. Daily checks will be performed to ensure continuing compliance with contract requirements, including efficiency of operations, control testing, and corrective action implementation until completion of the DFOW.

7.4.4. Completion Inspections

Completion Inspections will include the ERRG's Punch-Out Inspection and the Navy's Pre-Final Inspection and Final Inspection. The inspections and corrective actions will be completed within the schedule stated for completion of the entire work, or any particular increment thereof if the project is divided into increments by separate completion dates.

ERRGs Punch-Out Inspection: The Punch-Out Inspection will be performed by ERRG's project QC Manager near the completion of work or an increment the work. The project QC Manager will conduct an inspection of the work and will develop the "punch list" of items requiring corrective action. A copy of the punch list will be provided to the ROICC and Navy RPM. The project QC Manager will make follow-on inspections to ascertain that all deficiencies have been corrected. When this is completed, the project QC Manager will notify the ROICC and Navy RPM that the system is ready for their inspection.

DON's Pre-Final Inspection: The ROICC and Navy RPM will perform the Pre-Final Inspection to verify that the project has been constructed satisfactorily. A "Pre-Final Punch List" may be developed as a result of this inspection. ERRG's Project QC Manager will ensure that all items on this list are corrected in a timely manner and prior to notification to the Navy that a final inspection can be scheduled with ERRG.

Navy's Final Acceptance Inspection: The Final Acceptance Inspection will be scheduled by the ROICC and Navy RPM based on the results of the Pre-Final Inspection. ERRG will provide at least a 3-day notice to the ROICC and Navy RPM that the Pre-Final Punch List items have been completed, along with all remaining work performed under the contract.

7.5. DEFICIENCIES AND CORRECTIVE ACTIONS

Several mechanisms identify services or activities that do not comply with the contract requirements. These mechanisms include the following actions:

- Inspections
- Tests
- QA audits
- Notification(s) from the appropriate parties

In each case, noncompliance issues will be specifically identified in documents generated as a result of implementing the site-specific project plans. It will be the responsibility of the project QC Manager to notify the appropriate parties of the noncompliance and to ensure that corrective action is taken as soon as possible.

If necessary, the project QC Manager has the authority and responsibility to stop work related to or affected by the noncompliance condition until action can be taken to correct the non-compliance condition or prevent it from affecting related or subsequent work. The project QC Manager may, based on discretion, require that the work be retested and reinspected, if necessary, to confirm or disprove the noncompliance condition.

The project QC Manager may not permit any subsequent work to continue if that work is, or may be, affected by the noncompliance condition until one of the following events take place:

- The work is retested or reinspected and found to be in compliance.
- The work is redone and subsequently retested or reinspected and found to be in compliance.

As deficiencies are noted, they will be properly recorded on the Daily Production Report. The project QC Manager will maintain documentation to track deficiencies and corrective actions. Deficiencies will be evaluated for root causes to eliminate recurring problems.

Section 8. References

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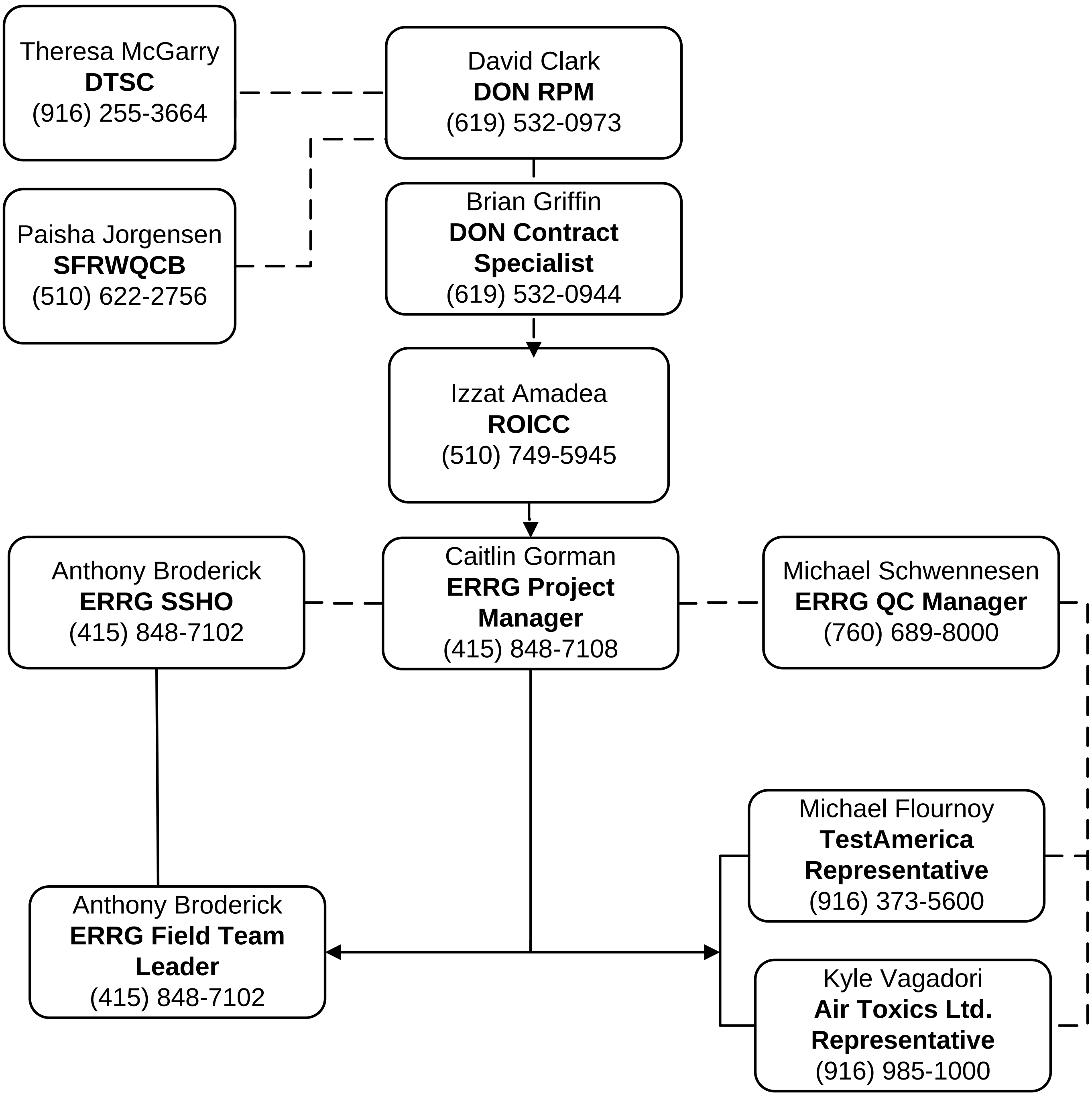
Figures



Explanation

– – – – Lines of Communication

——— Lines of Authority

ERRG Engineering/Remediation Resources Group, Inc. 115 Sansome St., Suite 200 San Francisco, CA 94104	CLIENT: DEPARTMENT OF THE NAVY	DESIGNED BY: AC 5/08/09	PROJECT ORGANIZATION CHART				
		CHECKED BY:					
	LOCATION: FORMER DoDHF NOVATO, CALIFORNIA	PE/PG	ERRG PROJECT NO. 29-059	REVISION NO. 1	SHEET 1	OF 1	FIG NO. 1

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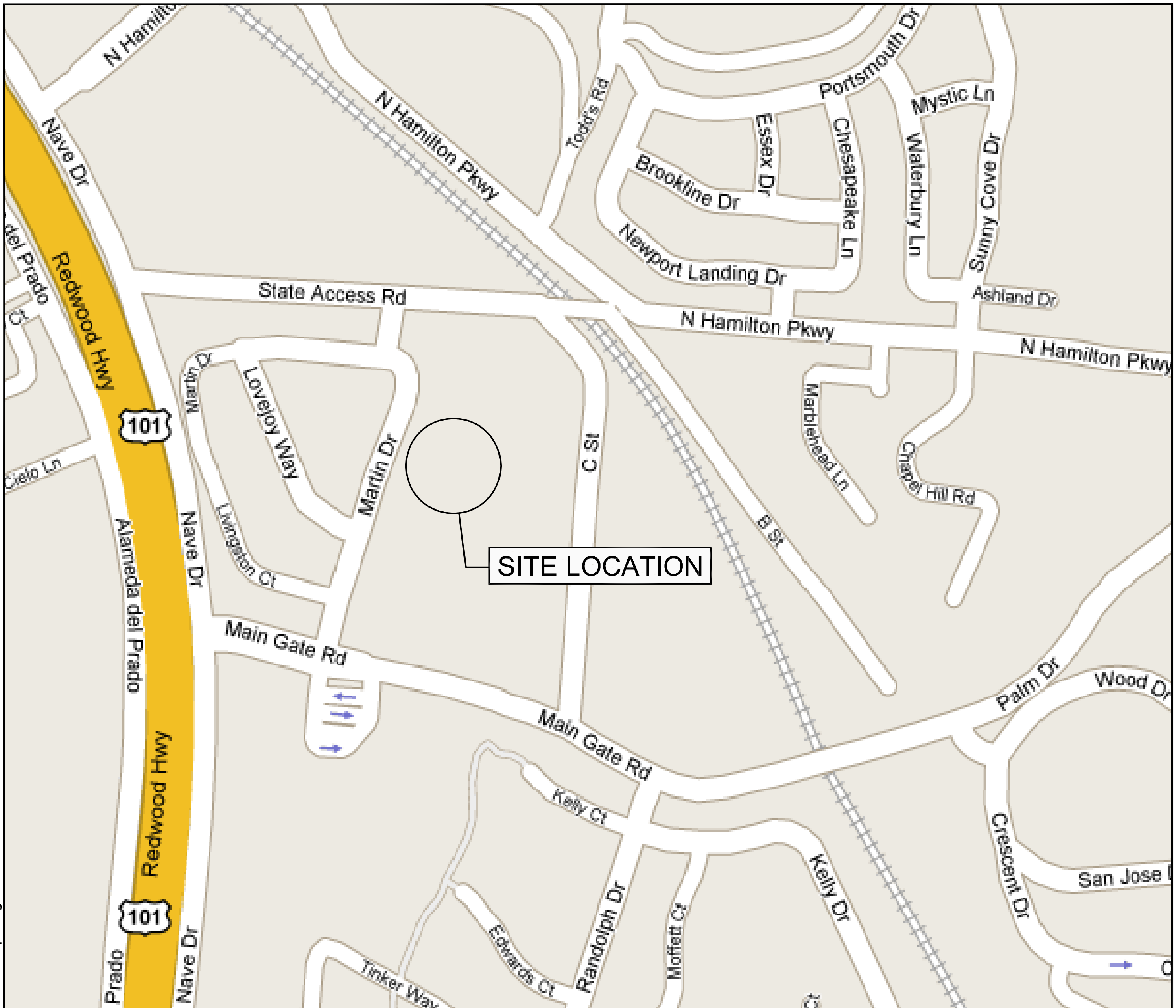

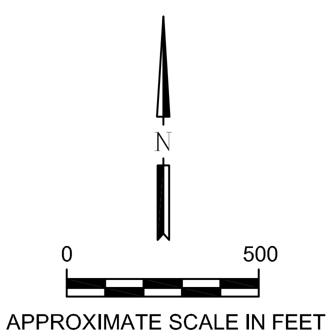

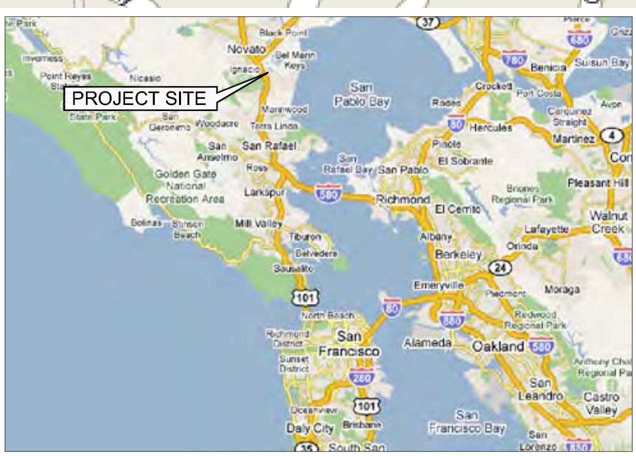

VICINITY MAP

ERRG Engineering/Remediation Resources Group, Inc. 115 Sansome St., Suite 200 San Francisco, California 94104 (415) 395-9974	CLIENT: DEPARTMENT OF THE NAVY	DESIGNED BY: VZC 5-11-09	SITE LOCATION AND VICINITY MAP			
		CHECKED BY: MB 5-11-09				
	LOCATION: FORMER DoDHF NOVATO, CALIFORNIA	P.E/P.G.: –	ERRG PROJECT NO. 29-059	REVISION NO. 0	SHEET 1 OF 1	FIG NO. 2

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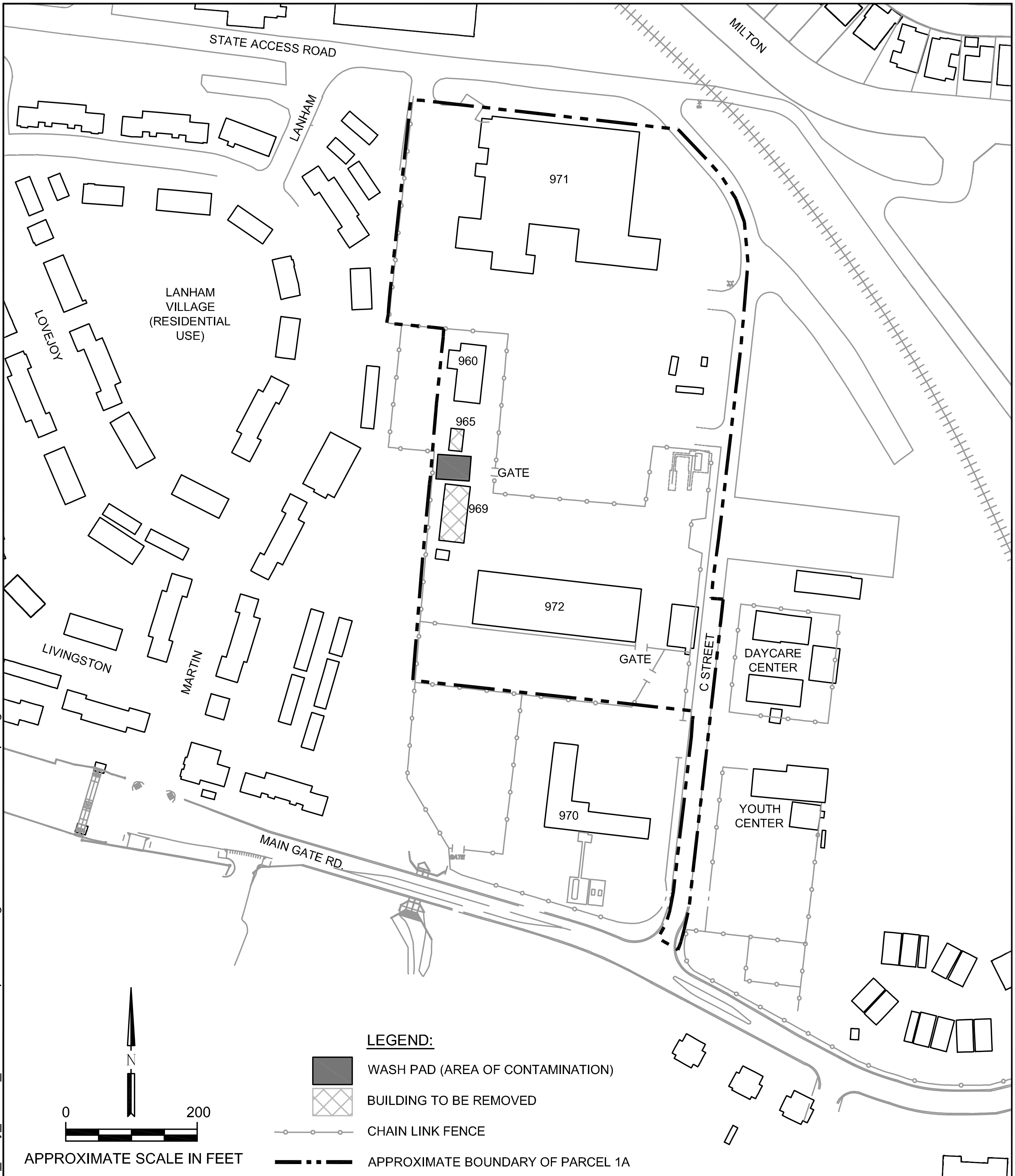

LEGEND:

- WASH PAD (AREA OF CONTAMINATION)
- BUILDING TO BE REMOVED
- CHAIN LINK FENCE
- APPROXIMATE BOUNDARY OF PARCEL 1A

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CLIENT: DEPARTMENT OF THE NAVY	DESIGNED BY: VZC 5-11-09	SITE FEATURES MAP					
	CHECKED BY: MB 5-11-09						
LOCATION: FORMER DoDHF NOVATO, CALIFORNIA	P.E/P.G.: CG 5-11-09	ERRG PROJECT NO. 29-059	REVISION NO. 0	SHEET 1	OF 1	FIG NO. 3	

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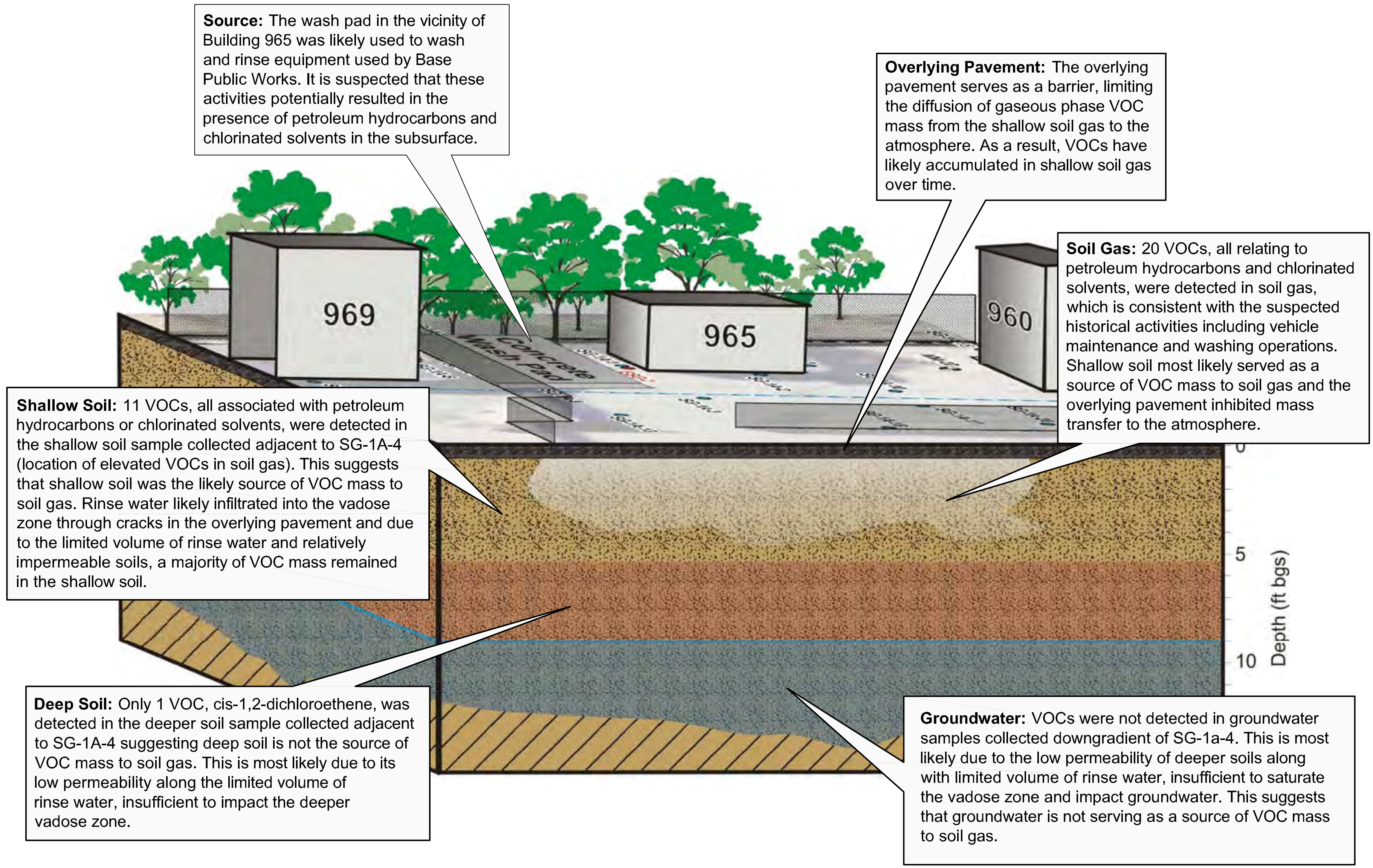

REFERENCE: BATTELLE, 2009, PERSONAL COMMUNICATION VIA E-MAIL FROM MR. RYAN WENSINK (BATTELLE) TO MS. CAITLIN GORMAN (ERRG), FEBRUARY 6.

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CLIENT: DEPARTMENT OF THE NAVY	DESIGNED BY: RDB 7-14-09	CONCEPTUAL SITE MODEL					
	CHECKED BY: MB 7-14-09						
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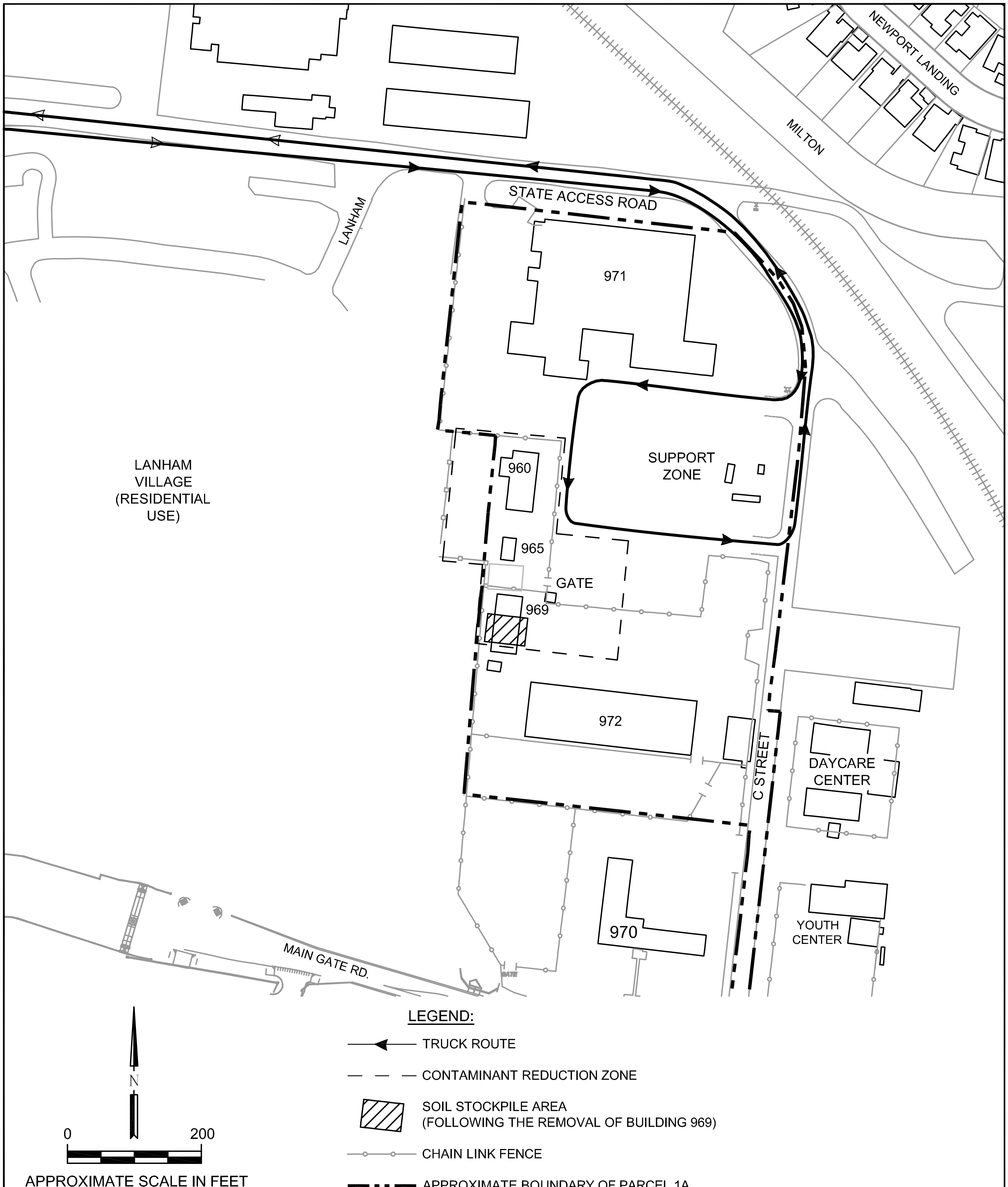

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P.E/P.G.:	CG 4-29-09
ERRG PROJECT NO.	29-059
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SHEET	1
OF	1
FIG NO.	5

WORK ZONE DELINEATION

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CLIENT: DEPARTMENT OF THE NAVY	DESIGNED BY: VZC 4-29-09	REMOVAL AREAS					
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	P.E/P.G.: CG 4-29-09	ERRG PROJECT NO. 29-059	REVISION NO. 0	SHEET 1	OF 1	FIG NO. 6	

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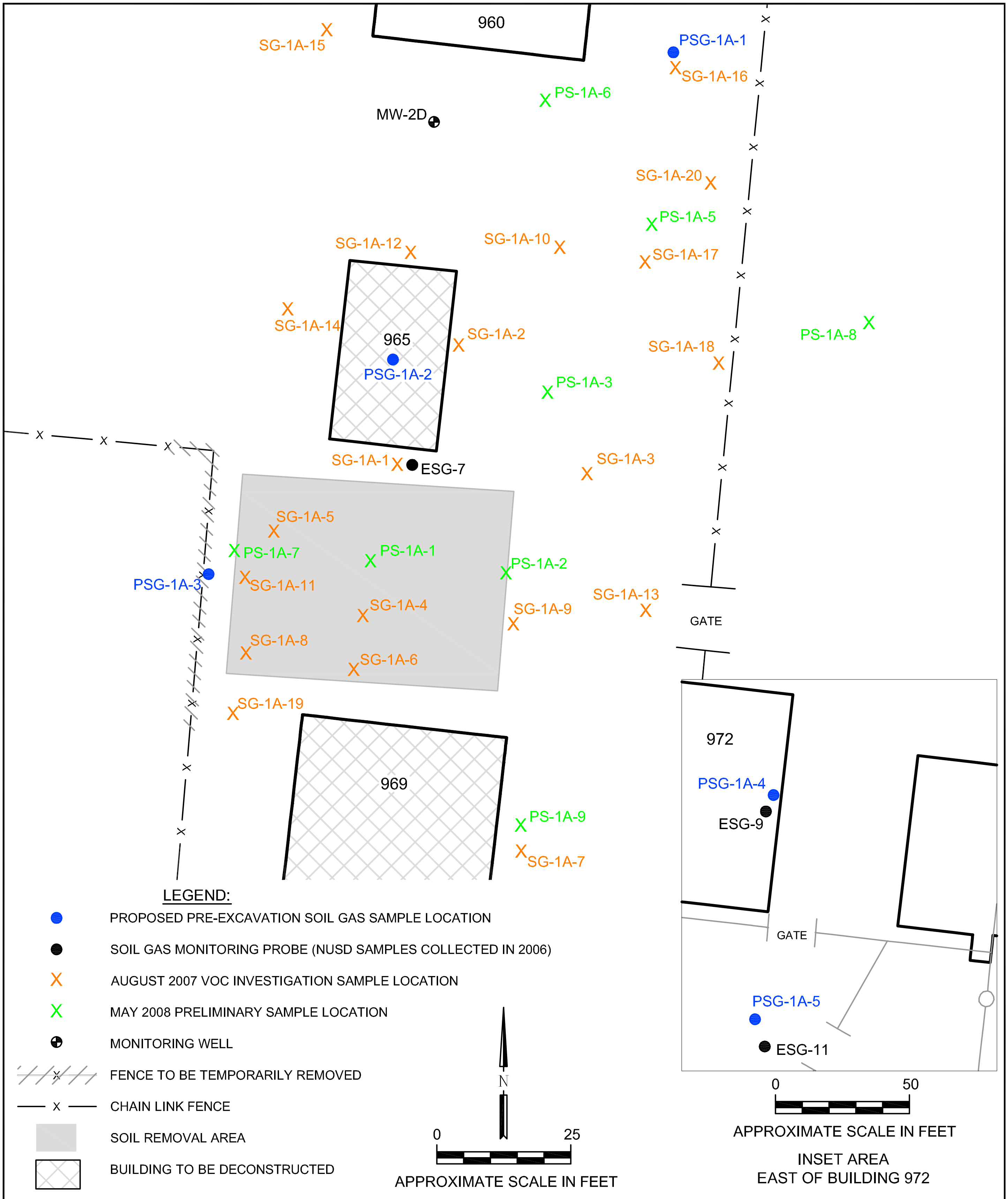

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ERRG Engineering/Remediation Resources Group, Inc. 115 Sansome St., Suite 200 San Francisco, California 94104 (415) 395-9974	CLIENT: DEPARTMENT OF THE NAVY	DESIGNED BY: VZC 5-21-09	PROPOSED PRE-EXCAVATION SOIL GAS SAMPLING LOCATIONS				
		CHECKED BY: MB 5-21-09					
	LOCATION: FORMER DoDHF NOVATO, CALIFORNIA	P.E/P.G.: CG 5-21-09	ERRG PROJECT NO. 29-059	REVISION NO. 0	SHEET 1	OF 1	FIG NO. 7

LEGEND:

- SOIL CONFIRMATION SAMPLE LOCATION (SIDE WALL)
- SOIL CONFIRMATION SAMPLE LOCATION (BOTTOM)
- BUILDING TO BE DECONSTRUCTED
- AREA OF PROTECTIVE SLOPING
- CHAIN LINK FENCE
- CHAINLINK FENCE TO BE TEMPORARILY REMOVED
- SOIL REMOVAL AREA
- WOODEN FENCE
- WOODEN FENCE TO BE TEMPORARILY REMOVED
- TREE TO BE PROTECTED

N

0 25

APPROXIMATE SCALE IN FEET

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DESIGNED BY:	VZC 5-21-09
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P.E/P.G.:	CG 5-21-09

POST-EXCAVATION SOIL CONFIRMATION SAMPLE LOCATIONS

ERRG PROJECT NO.	REVISION NO.	SHEET	OF	FIG NO.
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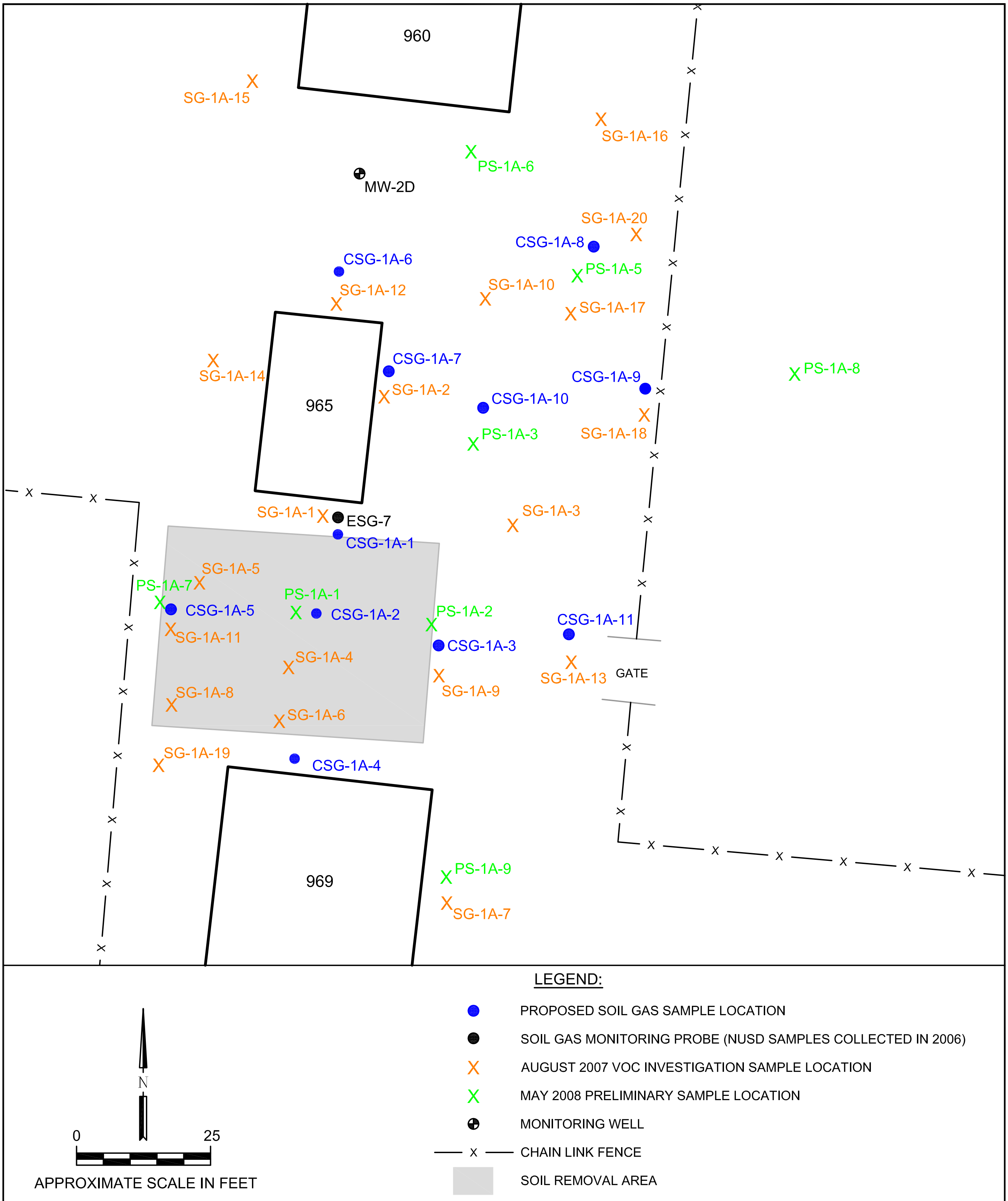

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CLIENT: DEPARTMENT OF THE NAVY	DESIGNED BY: VZC 5-21-09	PROPOSED POST-EXCAVATION SOIL GAS SAMPLING LOCATIONS				
	CHECKED BY: MB 5-29-09					
LOCATION: FORMER DoDHF NOVATO, CALIFORNIA	P.E/P.G.: CG 5-29-09	ERRG PROJECT NO. 29-059	REVISION NO. 0	SHEET 1	OF 1	FIG NO. 9

Appendix A. Sampling and Analysis Plan

Final

Sampling and Analysis Plan (Field Sampling Plan and Quality Assurance Project Plan), Non-Time-Critical Removal Action for the Building 965 Area

Former Department of Defense Housing Facility
Novato, California

October 2009

Prepared for:
Department of the Navy
Naval Facilities Engineering Command Southwest
San Diego, California

Prepared by:
Engineering/Remediation Resources Group, Inc.
115 Sansome Street, Suite 200
San Francisco, California 94104

Prepared under:
Naval Facilities Engineering Command
Contract Number N62473-09-D-2608
Document Control Number ERRG-2608-0003-0003

SAP WORKSHEET #1 – TITLE AND APPROVAL PAGE

Final

SAMPLING AND ANALYSIS PLAN
(Field Sampling Plan and Quality Assurance Project Plan)

Non-Time-Critical Removal Action for the
Building 965 Area
Former Department of Defense Housing Facility
Novato, California

Prepared for:
Department of the Navy
Naval Facilities Engineering Command Southwest
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San Diego, California 92131-5190

Prepared by:
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Prepared under:
Contract No.: N62473-09-D-2608
Task Order No.: 0003
DCN: ERRG-2608-0003-0003

Review Signatures: ______________________ Date: 10/07/09
Michael Schwennesen, ERRG QC Manager

Approved By: ______________________ Date: 10/20/2009
Nars Ancog, DON QA Officer

EXECUTIVE SUMMARY

This Sampling and Analysis Plan (SAP) has been prepared to support work to be performed by Engineering/Remediation Resources Group, Inc. (ERRG) for the Department of the Navy (DON) at the former Department of Defense Housing Facility (DoDHF) in Novato, California. This SAP addresses sampling activities to be conducted as part of the non-time-critical removal action (NTCRA) for the Building 965 Area. The Building 965 Area comprises Buildings 965 and 969 and the former wash pad, which is located between both of the buildings within Parcel 1A of DoDHF Novato. The DON is seeking to transfer Parcel 1A to the Novato Unified School District (NUSD) in cooperation with the California Department of Toxic Substances Control (DTSC) Office of Military Facilities and the School Site Program.

The NTCRA for soil beneath the wash pad is being implemented to address subsurface soil and soil gas contaminated with volatile organic compounds (VOCs) at concentrations that pose a potential risk to humans. The NTCRA was the selected alternative in an Engineering Evaluation/Cost Analysis developed to address the following removal action objective for soil gas at the site (Battelle, 2009):

- To reduce and/or manage human health risk to acceptable levels

The objectives of this SAP are to (1) provide a rationale for field sampling activities at the Building 965 Area as part of the NTCRA; (2) describe and establish consistent field sampling procedures; and (3) establish data gathering, handling, and documentation methods that are precise, accurate, representative, complete, and comparable to meet the quality control requirements for the project and the project quality objectives.

The Building 965 Area was initially investigated as part of the Environmental Baseline Survey (EBS) conducted by the DON in 1997. No chemicals of concern were identified during the EBS. In 2006, NUSD conducted a Preliminary Environmental Assessment (PEA), which included the Building 965 Area. Soil gas analytical results from the PEA indicated 28 VOCs were present in the samples collected. Based on the findings of the PEA, the DON recommended further investigation of the Building 965 Area. In 2007, results of an additional VOC investigation indicated that six VOCs (benzene, 1,3-butadiene, cis-1,2-dichloroethene, ethylbenzene, trichloroethene, and vinyl chloride) were detected in soil gas at concentrations exceeding risk-based screening levels (RBSLs)[1]. The highest concentrations of VOCs were centered under the wash pad. Results of additional sampling, conducted by the DON in May 2008, confirmed that benzene and vinyl chloride were consistently detected at concentrations exceeding RBSLs underneath the wash pad, and that benzene and vinyl chloride contributed most of the risk to human health via inhalation of indoor air in the vicinity of Building 965.

[1] Site-specific RBSLs were developed using the DTSC Johnson-Ettinger Model and are published in the "Draft Engineering Evaluation/Cost Analysis, Non-Time-Critical Removal Action for the Building 965 Area at Parcel 1A, Department of Defense Housing Facility, Novato, California" (Battelle, 2009).

The NTCRA for soil beneath the wash pad is being implemented to address subsurface soil and soil gas contaminated with VOCs at concentrations that pose a potential risk to humans. The VOC contamination is presumed to have originated from vehicle and equipment maintenance and washing on the wash pad. Although direct releases are not suspected, incidental releases have likely occurred over time, resulting in the accumulation of VOCs in the subsurface.

During NTCRA activities at the Building 965 Area, ERRG will collect pre- and post-excavation soil gas samples from several locations throughout the site, as well as soil confirmation samples from the excavation site and stockpile. Summa canister sampling techniques will be used to collect the soil gas samples. Monitoring and sampling procedures will follow the DTSC guidance, "Advisory – Active Soil Gas Investigations" (DTSC, 2003).

The soil and soil gas sampling events described in this SAP will generate data that will be used to:

- Quantify the residual concentrations of VOCs in soil and soil gas at the Building 965 Area
- Support the human health risk assessment
- Support a request for No Further Action for the Building 965 Area

SAP WORKSHEETS

SAP Worksheet #1 – Title and Approval Page 1
SAP Worksheet #2 – SAP Identifying Information 9
SAP Worksheet #3 – Distribution List 13
SAP Worksheet #4 – Project Personnel Sign-Off Sheet 15
SAP Worksheet #5 – Project Organizational Chart 16
SAP Worksheet #6 – Communication Pathways 17
SAP Worksheet #7 – Personnel Responsibilities and Qualification Table 20
SAP Worksheet #8 – Special Personnel Training Requirements Table 23
SAP Worksheet #9 – Project Scoping Session Participants Sheet 24
SAP Worksheet #10 – Problem Definition 25
SAP Worksheet #11 – Project Quality Objectives and Systematic Planning Process Statements 30
SAP Worksheet #12 – Measurement Performance Criteria Table 33
SAP Worksheet #13 – Secondary Data Criteria and Limitations Table 34
SAP Worksheet #14 – Summary of Project Tasks 35
SAP Worksheet #15.1 – Reference Limits and Evaluation Table 40
SAP Worksheet #15.2 – Reference Limits and Evaluation Table 41
SAP Worksheet #15.3 – Reference Limits and Evaluation Table 42
SAP Worksheet #15.4 – Reference Limits and Evaluation Table 46
SAP Worksheet #15.5 – Reference Limits and Evaluation Table 50
SAP Worksheet #15.6 – Reference Limits and Evaluation Table 51
SAP Worksheet #15.7 – Reference Limits and Evaluation Table 52
SAP Worksheet #16 – Project Schedule and Timeline Table 54
SAP Worksheet #17 – Sampling Design and Rationale 55
SAP Worksheet #18.1 – Sampling Locations, Methods, and SOP Requirements Table for Pre-Excavation Soil Gas Sampling 60
SAP Worksheet #18.2 – Sampling Locations, Methods, and SOP Requirements Table for Excavation Soil Sampling 61
SAP Worksheet #18.3 – Sampling Locations, Methods, and SOP Requirements Table for Post-Excavation Confirmation Soil Gas Sampling 63
SAP Worksheet #18.4 – Sampling Locations, Methods, and SOP Requirements Table for Backfill Sampling 65
SAP Worksheet #19 – Analytical methods and SOP Requirements Table 66
SAP Worksheet #20 – Field QC Sample Summary Table 68
SAP Worksheet #21 – Project Sampling SOP References Table 69
SAP Worksheet #22 – Field Equipment Calibration Maintenance, Testing, and Inspection Table 70
SAP Worksheet #23 – Analytical SOP References Table 71
SAP Worksheet #24 – Analytical Instrument Calibration Table 73

SAP WORKSHEETS *(continued)*

SAP Worksheet #25 – Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table 79
SAP Worksheet #26 – Sample Handling System 81
SAP Worksheet #27 – Sample Custody Requirements 82
SAP Worksheet #28.1 – Laboratory QC Samples Table 86
SAP Worksheet #28.2 – Laboratory QC Samples Table 87
SAP Worksheet #28.3 – Laboratory QC Samples Table 88
SAP Worksheet #28.4 – Laboratory QC Samples Table 91
SAP Worksheet #28.5 – Laboratory QC Samples Table 94
SAP Worksheet #28.6 – Laboratory QC Samples Table 96
SAP Worksheet #28.7 – Laboratory QC Samples Table 98
SAP Worksheet #28.8 – Laboratory QC Samples Table 100
SAP Worksheet #28.9 – Laboratory QC Samples Table 103
SAP Worksheet #29 – Project Documents and Records Table 111
SAP Worksheet #30 – Analytical Services Table 112
SAP Worksheet #31 – Planned Project Assessments Table 113
SAP Worksheet #32 – Assessment Finding and Corrective Action Responses Table 114
SAP Worksheet #33 – QA Management Reports Table 115
SAP Worksheet #34 – Verification (Step I) Process Table 116
SAP Worksheet #35 – Validation (Steps IIa and IIb) Process Table 118
SAP Worksheet #36 – Analytical Data Validation (Steps IIa and IIb) Summary Table 120
SAP Worksheet #37 – Usability Assessment 121

LIST OF FIGURES

Figure 1. Site Location and Vicinity Map
Figure 2. Site Features Map
Figure 3. Proposed Pre-Excavation Soil Gas Sample Locations
Figure 4. Post-Excavation Soil Confirmation Sample Locations
Figure 5. Proposed Post-Excavation Soil Gas Sample Locations

LIST OF TABLES

Table 28-1. Precision and Accuracy for Soil Gas Samples
Table 28-2. Precision and Accuracy for Soil Samples
Table 28-3. Recovery and Precision Limits for Backfill Samples

LIST OF ATTACHMENTS

Attachment A. Sampling Standard Operating Procedures

ACRONYMS AND ABBREVIATIONS

BEC	Base Realignment and Closure Environmental Coordinator
bgs	below ground surface
BRAC	Base Realignment and Closure
CA	corrective action
CCV	continuing calibration verification
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	chain of custody
CVVA	cold vapor atomic absorption
DCE	dichloroethene
DoD	U.S. Department of Defense
DoDHF	Department of Defense Housing Facility
DON	Department of the Navy
DQO	data quality objective
DTSC	Department of Toxics Substances Control
EBS	Environmental Baseline Survey
EDD	electronic data deliverable
EPA	U.S. Environmental Protection Agency
ERRG	Engineering/Remediation Resources Group, Inc.
GC/ECD	gas chromatograph/electron capture detector
GC/FID	gas chromatograph/flame ionization detector
GC/MS	gas chromatograph/mass spectrometry
HERD	Human and Ecological Risk Division
ICP	inductively coupled plasma
LCS	laboratory control spike
LCSD	laboratory control spike duplicate
LDC	Laboratory Data Consultants
MCL	maximum contaminant level
MS/MSD	matrix spike/matrix spike duplicate
NAVFAC SW	Naval Facilities Engineering Command Southwest
NELAP	National Environmental Laboratory Accreditation Program
NFA	No Further Action
NFESC	Naval Facilities Engineering Service Center
NTCRA	non-time-critical removal action
NUSD	Novato Unified School District

ACRONYMS AND ABBREVIATIONS *(continued)*

OMF	Office of Military Facilities
PALs	Project Action Limits
PCBs	polychlorinated biphenyls
PEA	Preliminary Environmental Assessment
PID	photoionization detector
PMO	Program Management Office
PQOs	project quality objectives
PWC	Public Works Center
QA	quality assurance
QAO	Quality Assurance Officer
QC	quality control
QCM	Quality Control Manager
QL	quantitation limit
QSM	Quality Systems Manual
RAO	removal action objective
RBSLs	risk-based screening levels
ROICC	Resident Officer in Charge of Construction
RPD	relative percent difference
RPM	Remedial Project Manager
RSD	relative standard deviation
SAP	Sampling and Analysis Plan
SFRWQCB	San Francisco Bay Regional Water Quality Control Board
SIM	Selected ion monitoring
SSHO	Site Safety and Health Officer
SOP	Standard Operating Procedure
SVOC	semivolatile organic compounds
TCE	trichloroethene
UFP-QAPP	Uniform Federal Policy for Quality Assurance Project Plan
VOCs	volatile organic compounds

SAP WORKSHEET #2 – SAP IDENTIFYING INFORMATION

Site Name: Building 965 Area
Site Location: Former Department of Defense Housing Facility (DoDHF) Novato, California
Contract Name: Performance Based 8(a) Environmental Multiple Action Contract for Remediation Services
Contract Number: N62473-09-D-2608
Task Order: 0003

1. This Sampling and Analysis Plan (SAP) was prepared in accordance with the requirements of the "Uniform Federal Policy for Quality Assurance Plans" (UFP-QAPP) (U.S. Environmental Protection Agency [EPA], 2005) and "Guidance for Quality Assurance Project Plans, EPA QA/G-5" (EPA, 2002).

2. Identify regulatory program: Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Program

3. This SAP is a project-specific SAP.

4. List dates of scoping sessions that were held:

Scoping Session	Date
Novato Non-Time-Critical Removal Action (NTCRA) Kick-Off Meeting	April 21, 2009

5. List dates and titles of any SAP documents written for previous site work that are relevant to the current investigation:

Scoping Session	Date
"Internal Draft Sampling and Analysis Plan (Field Sampling Plan and Quality Assurance Project Plan) for the Time-Critical Removal Action Work Plan, Building 965 Area within Public Benefit Conveyance Parcel 1A, Department of Defense Housing Facility, Novato, California"	June 2008

6. List organizational partners (stakeholders) and connection with lead organization:

   Lead: Department of the Navy (DON), Base Realignment and Closure (BRAC) Program Management Office (PMO) West

   Document Review: Department of Toxic Substances Control (DTSC) Office of Military Facilities (OMF) and School Sites Program and San Francisco Bay Regional Water Quality Control Board (SFRWQCB)

7. Lead Organization: DON, BRAC PMO West

If any required SAP elements and required information are not applicable to the project or are provided elsewhere, then note the omitted SAP elements and provide an explanation for their exclusions in the following pages.

SAP WORKSHEET #2 – SAP IDENTIFYING INFORMATION *(continued)*

UFP-QAPP Worksheet No.	Required Information	Crosswalk to Related Information
A. Project Management		
Documentation		
1	Title and Approval Page	
2	Table of Contents SAP Identifying Information	
3	Distribution List	
4	Project Personnel Sign-Off Sheet	
Project Organization		
5	Project Organizational Chart	
6	Communication Pathways	
7	Personnel Responsibilities and Qualifications Table	
8	Special Personnel Training Requirements Table	This worksheet is not applicable. There is no specialized training required for this project.
Project Planning/Problem Definition		
9	Project Scoping Session Participants Sheet (including Data Needs tables)	
10	Problem Definition (including site maps; historical and present)	
11	Project Quality Objectives and Systematic Planning Process Statements	
12	Measurement Performance Criteria Table – Soil and Soil Gas	
13	Secondary Data Criteria and Limitations Table	
14	Summary of Project Tasks	
15	Reference Limits and Evaluation Table	
16	Project Schedule and Timeline Table	
B. Measurement Data Acquisition		
Sampling Tasks		
17	Sampling Design and Rationale	
18	Sampling Locations, Methods, and SOP Requirements Table	
19	Analytical Methods and SOP Requirements Table	
20	Field QC Sample Summary Table	

SAP WORKSHEET #2 - SAP IDENTIFYING INFORMATION *(continued)*

UFP-QAPP Worksheet No.	Required Information	Crosswalk to Related Information
B. Measurement Data Acquisition *(continued)*		
21	Project Sampling SOP References Table Sampling SOPs	
22	Field Equipment Calibration, Maintenance, Testing, and Inspection Table	
Analytical Tasks		
23	Analytical SOP References Table	
24	Analytical Instrument Calibration Table	
25	Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table	
Sample Collection		
26	Sample Handling System Sample Handling Flow Diagram	
27	Sample Custody Requirements, Procedures/SOPs Sample Container Identification Example Chain-of-Custody Form and Seal	
Quality Control Samples		
28	Laboratory QC Samples Table Screening/Confirmatory Analysis Decision Tree	
Data Management Tasks		
29	Project Documents and Records Table	
30	Analytical Services Table Analytical and Data Management SOPs	
C. Assessment Oversight		
31	Planned Project Assessments Table Audit Checklists	
32	Assessment Findings and Corrective Action (CA) Responses Table	
33	QA Management Reports Table	
D. Data Review		
34	Verification (Step I) Process Table	
35	Validation (Steps IIa and IIb) Process Table	
36	Analytical Data Validation (Steps IIa and IIb) Summary Table	
37	Usability Assessment	

SAP WORKSHEET #3 – DISTRIBUTION LIST

Name of SAP Recipients	Title/Role	Organization	Telephone Number	Mailing Address
David Clark	Remedial Project Manager (RPM)	BRAC PMO West	619-532-0973	BRAC PMO West 1455 Frazee Road, Suite 900 San Diego, CA 92108
Nars Ancog	Quality Assurance Officer (QAO)	Naval Facilities Engineering Command Southwest (NAVFAC SW)	619-532-3046	NAVFAC SW 1220 Pacific Highway San Diego, CA 92132-5181
James Sullivan	BRAC Environmental Coordinator (BEC)	BRAC PMO West	619-532-0966	BRAC PMO West 1455 Frazee Road, Suite 900 San Diego, CA 92108
Izzat Amadea	Resident Officer in Charge of Construction (ROICC)	ROICC Office	510-749-5945	ROICC Office 2450 Saratoga St, Suite 200 Alameda, CA 94501
Diane Silva (2 copies)	Administrative Records	NAVFAC SW	619-532-3676	NAVFAC Southwest, Admin Records 937 N Harbor Dr 3 Floor Room 71 San Diego CA 92132
Paisha Jorgensen	SFRWQCB Project Manager	SFRWQCB	510-622-2756	SFRWQCB 1515 Clay Street, Suite 1400, Oakland, CA, 94612
Theresa McGarry	DTSC Project Manager	DTSC OMF	916-255-3664	DTSC OMF 8800 Cal Center, 2nd floor Sacramento, CA, 95826-3200
Michael Wade	DTSC Human and Ecological Risk Division (HERD)	DTSC	916-255-6653	DTSC Office of Scientific Affairs (216 MS) 8800 Cal Center Drive Sacramento, CA 95826-3200
Tracy Behrsing	DTSC HERD	DTSC	916-255-6646	DTSC 8800 Cal Center Drive Sacramento, CA 95826-3200

SAP WORKSHEET #3 – DISTRIBUTION LIST *(continued)*

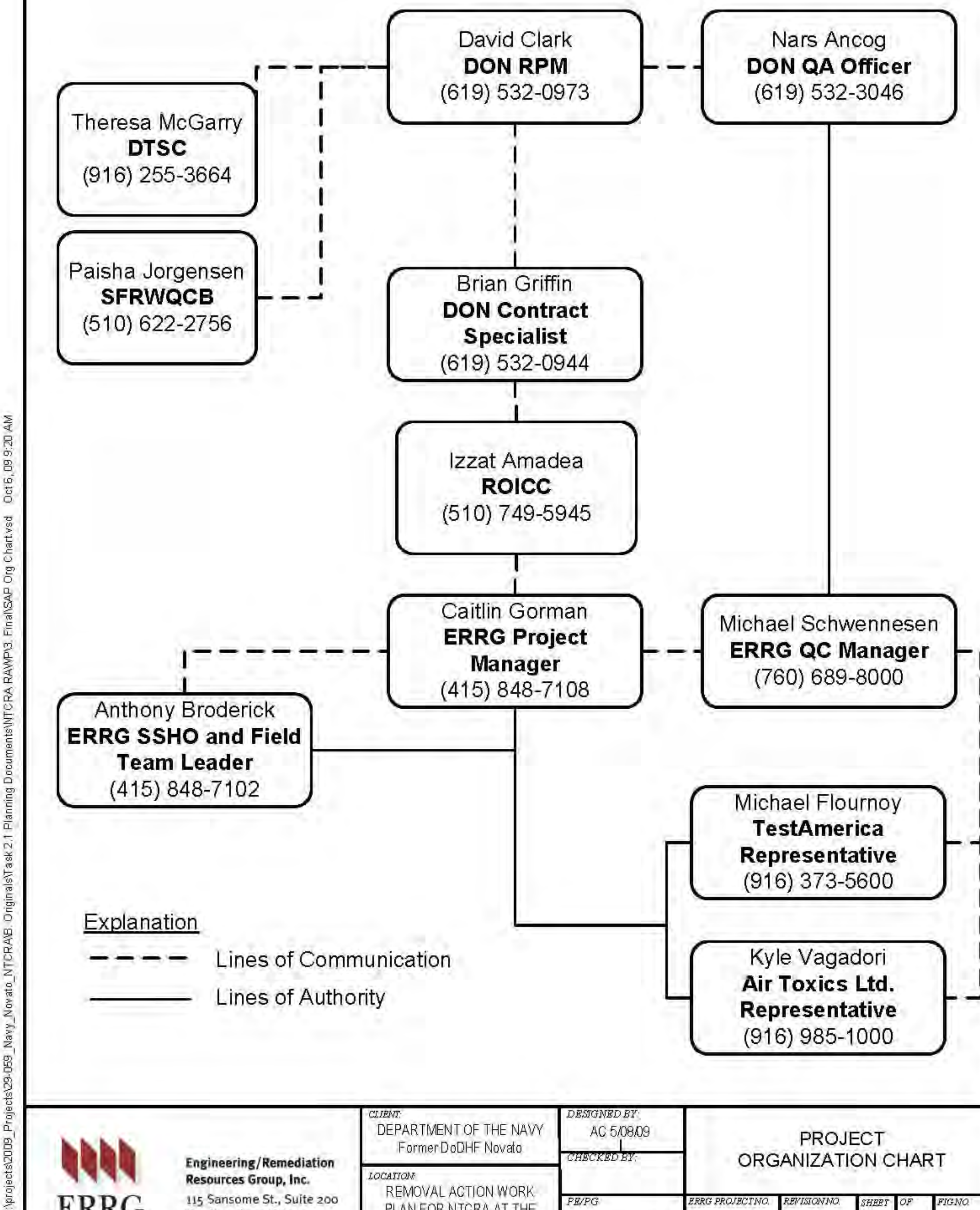
Name of SAP Recipients	Title/Role	Organization	Telephone Number	Mailing Address
Eric Sciullo	DTSC HERD	DTSC	916-255-6627	DTSC 8800 Cal Center Drive Sacramento, CA 95826-3200
John Silvestrini	Novato Unified School District (NUSD)	NUSD	415-897-4245	NUSD 1015 Seventh Street Novato, CA 94945
Caitlin Gorman	Engineering/Remediation Resources Group, Inc. (ERRG) Project Manager	ERRG	415-848-7108	ERRG 115 Sansome Street, Suite 200 San Francisco, CA 94104
Anthony Broderick	ERRG Field Team Leader and Site Safety and Health Officer (SSHO)	ERRG	415-359-8792	ERRG 115 Sansome Street, Suite 200 San Francisco, CA 94104
Michael Schwennesen	Quality Control Manager (QCM)	ERRG	760-689-8000	ERRG 3080 Green Heather Lane Fallbrook, CA 92028
Travis Williamson	Battelle Project Manager	Battelle	614-424-4796	Battelle 505 King Avenue Columbus, OH 43201
Ryan Wensink	Battelle Technical Advisor	Battelle	614-424-3801	Battelle 505 King Avenue Columbus, OH 43201

SAP WORKSHEET #4 – PROJECT PERSONNEL SIGN-OFF SHEET

The purpose of the sign-off sheet is to document that key personnel responsible have read and understood the SAP prior to performing their duties.

Project Personnel	Organization/Title/Role	Telephone Number	Signature/E-Mail Receipt	SAP Section Reviewed	Date SAP Read
Caitlin Gorman	ERRG/Project Manager/Oversees Project	415-848-7108		Entire Document	
Anthony Broderick	ERRG/Field Team Leader and SSHO	415-359-8792		Entire Document	
Travis Williamson	Battelle/Project Manager	614-424-4796		Entire Document	
Ryan Wensink	Battelle/Technical Advisor	614-424-3801		Entire Document	
Michael Flournoy	TestAmerica Laboratory/Laboratory Representative/Oversees Soil Analytical Work	916-373-5600		Entire Document	
Kyle Vagadori	Air Toxics Ltd./Laboratory Representative/Oversees Soil Gas Analytical Work	916-985-1000		Entire Document	
Erlinda Rauto	Laboratory Data Consultants (LDC)/Laboratory Representative/Oversees Data Validation	760-634-0437		Entire Document	

SAP WORKSHEET #5 – PROJECT ORGANIZATIONAL CHART



ERRG Engineering/Remediation Resources Group, Inc. 115 Sansome St., Suite 200 San Francisco, CA 94104	CLIENT: DEPARTMENT OF THE NAVY Former DoDHF Novato	DESIGNED BY: AC 5/08/09	PROJECT ORGANIZATION CHART				
		CHECKED BY:					
	LOCATION: REMOVAL ACTION WORK PLAN FOR NTCRA AT THE BUILDING 965 AREA	PE/PG	ERRG PROJECT NO. 29-059	REVISION NO. 1	SHEET 1	OF 1	FIG NO. 1

SAP WORKSHEET #6 – COMMUNICATION PATHWAYS

Communication Drivers	Responsible Entity	Name	Phone Number and/or E-mail	Procedure (Timing, Pathways, etc.)
Regular communication with DON RPM	ERRG Project Manager	Caitlin Gorman	415-848-7108 caitlin.gorman@errg.com	Frequent communication between the Project Manager and the RPM during field effort either phone call or e-mail.
Regular communication with ERRG Project Manager	Battelle Project Manager	Travis Williamson	614-424-4796 williamsont@battelle.org	Frequent communication between the Battelle Project Manager and the ERRG Project Manager during project either via phone call or e-mail.
Approval of all versions to the SAP	NAVFAC SW QAO	Narciso Ancog	619-532-3046 narciso.ancog@navy.mil	All versions to the SAP will be submitted in writing by the ERRG Project Manager. The NAVFAC SW QAO will review and approve all SAP versions prior to their implementation.
Initiation, notification, and approval of real-time modifications to the SAP	ERRG Project Manager	Caitlin Gorman	415-848-7108 caitlin.gorman@errg.com	Generate SAP revisions and obtain NAVFAC SW's QAO's review and approval.
SAP review	ERRG QCM	Michael Schwennesen	760-689-8000 michael.schwennesen@errg.com	SAP will be reviewed and approved internally by the ERRG QCM prior to submittal to the NAVFAC SW QAO. The ERRG QCM will maintain communication with the NAVFAC SW QAO via phone calls and e-mail to obtain approval of the SAP and to discuss project status and any issues that arise during the the project.
Initiation of fieldwork	BRAC PMO West	David Clark	619-532-0973 david.j.clark2@navy.mil	The DON RPM will notify the ERRG Project Manager by phone of the approval of commencement of fieldwork.
Notification of near miss and incident	ERRG Project Manager	Caitlin Gorman	415-848-7108 caitlin.gorman@errg.com	The ERRG Field Team Leader will notify the ERRG Project Manager by phone of a near miss and health or safety incident immediately. The ERRG PM will notify the DON RPM by phone within 8 hours of the near miss and incident.
Daily report	ERRG Field Team Leader	Anthony Broderick	415-359-8792 anthony.broderick@errg.com	Daily updates from ERRG Field Team Leader to ERRG Project Manager.

SAP WORKSHEET #6 – COMMUNICATION PATHWAYS *(continued)*

Communication Drivers	Responsible Entity	Name	Phone Number and/or E-mail	Procedure (Timing, Pathways, etc.)
Confirmation soil sample receipt notification	TestAmerica Laboratory Representative	Michael Flournoy	916-373-5600 michael.flournoy@testamericainc.com	Telephone call and faxed notification of sample receipt; chain-of-custody (COC) review from the Laboratory Representative to the ERRG Project Manager.
Notification of issues related to analytical data quality and loss	TestAmerica Laboratory Representative	Michael Flournoy	916-373-5600 michael.flournoy@testamericainc.com	The Laboratory Representative will notify the ERRG Project Manager of any laboratory data issues. The ERRG Project Manager will notify the DON RPM by phone within 24 hours.
Soil gas sample receipt notification	Air Toxics Ltd. Representative	Kyle Vagadori	916-985-1000 kvagadori@airtoxics.com	Telephone call and faxed notification of sample receipt; COC review from the Laboratory Representative to the ERRG Project Manager.
Notification of issues related to analytical data quality and loss	Air Toxics Ltd. Representative	Kyle Vagadori	916-985-1000 kvagadori@airtoxics.com	The Laboratory Representative will notify the ERRG Project Manager of any laboratory data issues. The ERRG Project Manager will notify the DON RPM by phone within 24 hours.
Real-time modification of SAP activities (e.g., sample location)	ERRG Project Manager	Caitlin Gorman	415-848-7108 caitlin.gorman@errg.com	Generate SAP revisions and obtain NAVFAC SW's QAO's review and approval.
Regular communication with NAVFAC SW QAO	ERRG QCM	Michael Schwennesen	760-689-8000 michael.schwennesen@errg.com	Communication via phone calls and e-mail to obtain approval of the planning documents (e.g., SAP) and to discuss project status and any issues that arise during the conduct of the project.
Initiation, notification, and approval of stop work orders	ERRG Project Manager	Caitlin Gorman	415-848-7108 caitlin.gorman@errg.com	Stop work orders will be approved by the ERRG Project Manager. The DON RPM will be notified by the ERRG Project Manager by phone within 8 hours of a stop work order.
Approval for commencement of work following a stop work order	BRAC PMO West	David Clark	619-532-0973 david.j.clark2@navy.mil	The DON RPM will notify the ERRG Project Manager by phone with the approval of the commencement of work following a stop work order.

SAP WORKSHEET #6 – COMMUNICATION PATHWAYS *(continued)*

Communication Drivers	Responsible Entity	Name	Phone Number and/or E-mail	Procedure (Timing, Pathways, etc.)
Approval and initiation of CA	BRAC PMO West	David Clark	619-532-0973 david.j.clark2@navy.mil	The DON RPM will approve of any and all CAs prior to their initiation.
Approval of the release of data to the public	BRAC PMO West	David Clark	619-532-0973 david.j.clark2@navy.mil	Only the DON RPM will approve the release of project data to the public.

SAP WORKSHEET #7 – PERSONNEL RESPONSIBILITIES AND QUALIFICATION TABLE

Name	Title/Role	Organizational Affiliation	Responsibilities	Education and Experience Qualifications (Optional)
David Clark	RPM/oversees project as technical lead for DON	BRAC PMO West	▪ Final approval for conducting all field activities ▪ Oversight of the overall task order ▪ Approval of selected subcontractors ▪ Execution of contracts ▪ Approval of the release of study reports ▪ Coordinates with NAVFAC SW QAO to resolve project quality assurance (QA) issues.	
Narciso Ancog	QAO/oversees quality assurance tasks for DON	NAVFAC SW	▪ Oversight of QA issues for entire program ▪ Provides quality-related directives through Contracting Officer's Technical Representative ▪ Provides technical and administrative oversight of ERRG surveillance audit activities ▪ Acts as point of contact for all matters concerning QA and the DON's Laboratory QA Program ▪ Prepares governmental budget estimates for all QA functions included in ERRG contracts ▪ Coordinates training on matters pertaining to generation and maintenance of quality of data ▪ Review and approval of SAP and all other QA and quality control (QC) documents ▪ Communication of issues to the DON RPM ▪ Authorized to suspend project execution if QA requirements are not adequately followed	

SAP WORKSHEET #7 – PERSONNEL RESPONSIBILITIES AND QUALIFICATION TABLE *(continued)*

Name	Title/Role	Organizational Affiliation	Responsibilities	Education and Experience Qualifications (Optional)
Caitlin Gorman	ERRG Project Manager/oversees project	ERRG	▪ Manage task order contract ▪ Assign personnel ▪ Monitor and control of cost, schedule, and quality ▪ Compliance with regulations ▪ Manage subcontractors	
Travis Williamson	Battelle Project Manager/oversees project	Battelle	▪ Communication with ERRG Project Manager ▪ Ensure work being performed in accordance with Engineering Evaluation/Cost Analysis and Action Memorandum	
Michael Schwennesen	ERRG QCM/oversees field and data results QC	ERRG	▪ Approval of SAP ▪ Review of data ▪ Coordinate data validation ▪ Interact with NAVFAC SW QAO ▪ Develops CA as required.	
Anthony Broderick	ERRG SSHO/oversees field tasks as SSHO	ERRG	▪ Monitor site health and safety in accordance with the work plan	
Anthony Broderick	ERRG Field Team Leader/oversees field tasks	ERRG	▪ Perform all sampling in accordance with the approved SAP ▪ Calibrate and maintain field measurement equipment ▪ Complete field documentation	
Melissa Boronda	Field Sampling Team Member	ERRG	▪ Performs all sampling in accordance with approved SAP ▪ Implements field CAs as required.	

SAP WORKSHEET #7 – PERSONNEL RESPONSIBILITIES AND QUALIFICATION TABLE *(continued)*

Name	Title/Role	Organizational Affiliation	Responsibilities	Education and Experience Qualifications (Optional)
Michael Flournoy	Laboratory Representative/oversees analytical work	TestAmerica Laboratory Sacramento, California	▪ Manages generation of confirmation soil analytical data	
Kyle Vagadori	Laboratory Representative/oversees analytical work	Air Toxics Ltd.	▪ Manages generation of soil gas analytical data	
Erlinda Rauto	Laboratory Representative/oversees data validation	LDC	▪ Performs data validation	

SAP WORKSHEET #8 – SPECIAL PERSONNEL TRAINING REQUIREMENTS TABLE

Project Function	Specialized Training – Title or Description of Course	Training Provider	Training Date	Personnel/Groups Receiving Training	Personnel Titles/ Organizational Affiliation	Location of Training Records/Certificates

Not Applicable

Note: Worksheet #8 is not applicable to this project. There no special training requirements.

For this project, there are no specialized training requirements. However, field personnel will have been trained in sampling procedures and have current 40-hour Occupational Safety and Health Administration (OSHA) Hazardous Waste Operations and Emergency Response training.

SAP WORKSHEET #9 – PROJECT SCOPING SESSION PARTICIPANTS SHEET

Project Name: Non-Time-Critical Removal Action of the Building 965 Area **Projected Date(s) of Sampling:** 3rd Quarter 2009 **Project Manager:** Caitlin Gorman	**Site Name:** Building 965 Area **Site Location:** DoDHF Novato, California
Date of Session: 21 April 2009 **Scoping Session Purpose:** Determine what kind of sampling and investigation will be conducted at the site	

Name	Title	Affiliation	Phone No.	E-mail Address	Project Role
David Clark	DON RPM	BRAC PMO West	619-532-0973	david.j.clark2@navy.mil	DON RPM
James Sullivan	DON BEC	BRAC PMO-West	619-532-0966	james.b.sullivan2@navy.mil	DON BEC
Theresa McGarry	DTSC Project Manager	DTSC OMF	916-255-3664	TMcgarry@dtsc.ca.gov	DTSC Project Manager
Paisha Jorgensen	SFRWQCB Project Manager	SFRWQCB	510-622-2756	pjorgensen@waterboards.ca.gov	SFRWQCB Project Manager
John Silvestrini	NUSD Project Manager	NUSD	415-897-4245	jsilvestrini@nusd.org	NUSD Project Manager
Caitlin Gorman	ERRG Professional Geologist	ERRG	415-848-7108	caitlin.gorman@errg.com	ERRG Project Manager
Travis Williamson	Battelle Professional Engineer	Battelle	614-424-4796	williamsont@battelle.org	Battelle Project Manager
Ryan Wensink	Battelle Project Engineer	Battelle	614-424-3801	wensinkr@battelle.org	Battelle Technical Advisor

Comments and Decisions:

- Increased number of pre-excavation soil and soil gas samples from up to 5 to up to 10. Removed 10 grab soil gas confirmation samples. Soil gas samples can only be collected from within the DoDHF property boundary.

Action Items: None

Consensus Decisions: None

SAP WORKSHEET #10 – PROBLEM DEFINITION

The former DoDHF Novato is located in Marin County, Novato, California, approximately 25 miles northwest of San Francisco (Figure 1). From the mid-1970s to the early 1990s, the DON occupied the DoDHF and various support operations, including the Public Works Center (PWC). Currently, the DON is seeking to transfer Public Benefit Conveyance Parcel 1A, which includes Building 965, to the NUSD in cooperation with the DTSC and the School Site Program (Figure 2).

The Building 965 Area was initially investigated as part of the Environmental Baseline Survey (EBS) conducted by the DON in 1997. No chemicals of concern were identified during the EBS. In 2006, NUSD conducted a Preliminary Environmental Assessment (PEA), which included the Building 965 Area. Soil gas analytical results from the PEA indicated 28 volatile organic compounds (VOCs) were present in the samples collected. Based on the findings of the PEA, the DON recommended further investigation of the Building 965 Area. In 2007, results of a VOC investigation indicated that six VOCs (benzene, 1,3-butadiene, cis-1,2-dichloroethene [DCE], ethylbenzene, trichloroethene [TCE], and vinyl chloride) were detected in soil gas at concentrations exceeding risk-based screening levels (RBSLs)[2]. The highest concentrations of VOCs were found under the wash pad. Additional sampling, conducted by the DON in May 2008, confirmed that benzene and vinyl chloride were consistently detected at concentrations exceeding RBSLs underneath the wash pad, and that benzene and vinyl chloride contributed most of the risk to human health via inhalation of indoor air in the vicinity of Building 965.

Available documentation indicated that Building 965 was previously used to support automotive maintenance activities. Specifically, a concrete pad on which vehicles may have been washed was located south of Building 965 and is likely the source of VOCs in soil gas (PRC Environmental Management, Inc., 1997). Although direct releases are not suspected, incidental releases have likely occurred over time, resulting in the accumulation of VOCs in the subsurface at concentrations that pose an unacceptable risk to a future hypothetical resident of the site. Rinse water likely infiltrated into the vadose zone through small cracks in the overlying concrete and pavement and along a drainage path toward the western edge of the concrete pad. It is likely that rinse water remained in shallow soil due to the limited volume and low permeability of the soils. The overlying pavement probably served as a barrier limiting the diffusion of gaseous-phase VOC mass from shallow soil and soil gas to the atmosphere. The NTCRA for soil beneath the wash pad is being implemented to address subsurface soil and soil gas contaminated with VOCs at concentrations that pose a potential risk to humans.

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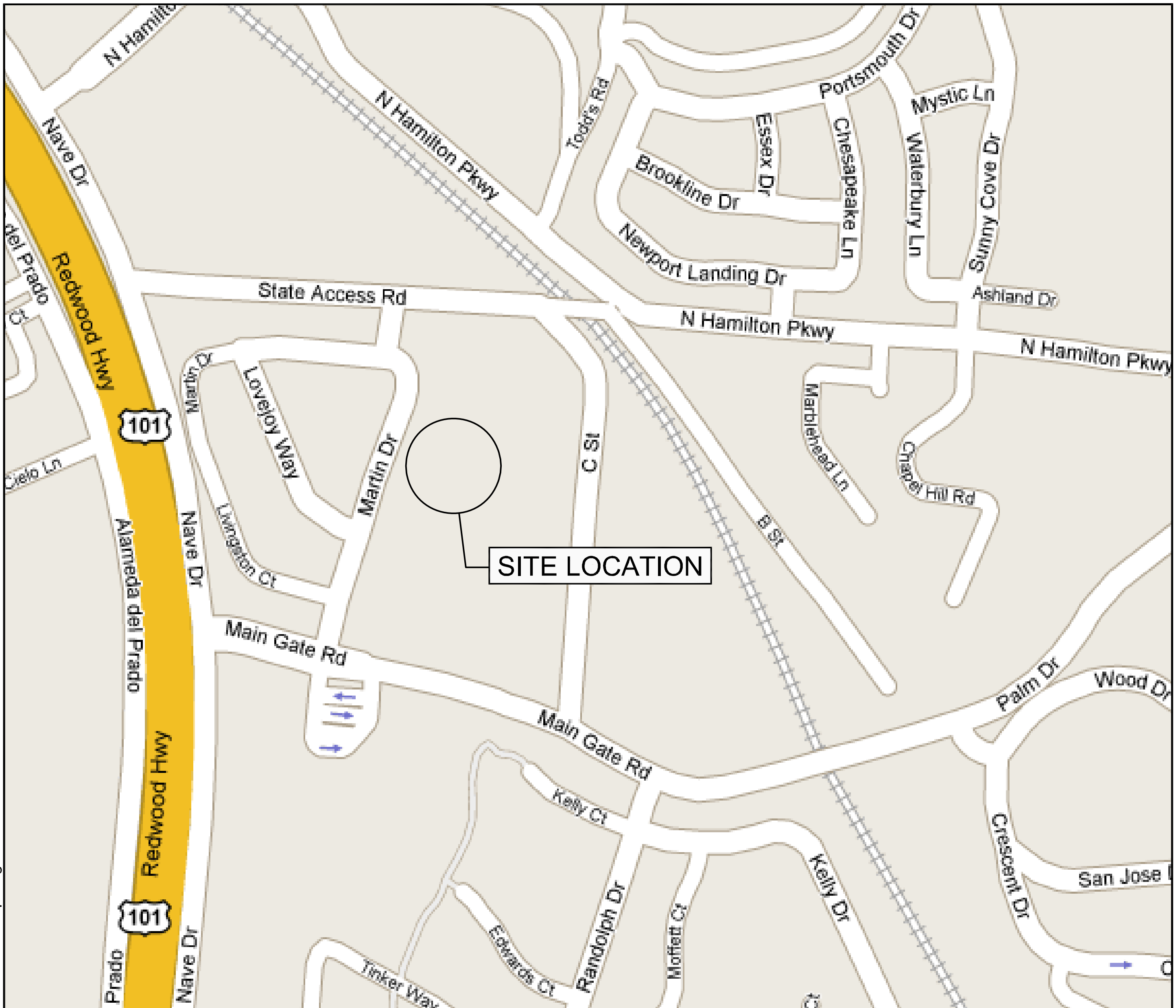
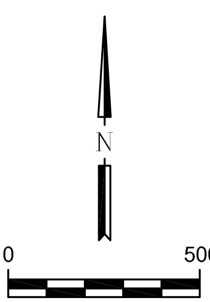
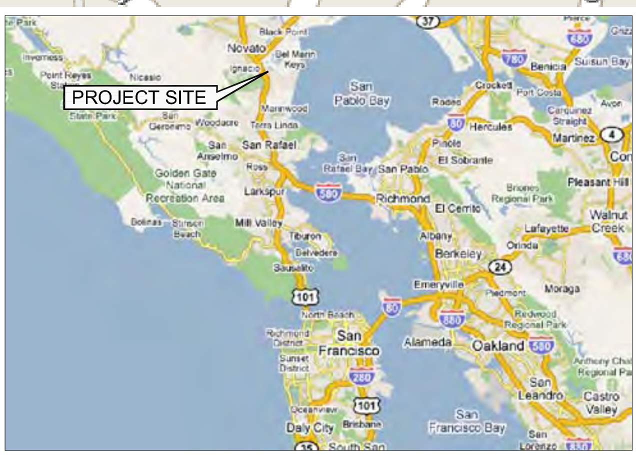
[2] Site-specific RBSLs were developed using the DTSC Johnson-Ettinger Model and are published in the "Draft Engineering Evaluation/Cost Analysis, Non-Time-Critical Removal Action for the Building 965 Area at Parcel 1A, Department of Defense Housing Facility, Novato, California" (Battelle, 2009).





APPROXIMATE SCALE IN FEET



VICINITY MAP

ERRG Engineering/Remediation Resources Group, Inc. 115 Sansome St., Suite 200 San Francisco, California 94104 (415) 395-9974	CLIENT: DEPARTMENT OF THE NAVY	DESIGNED BY: VZC 5-11-09	SITE LOCATION MAP			
		CHECKED BY: MB 5-11-09				
	LOCATION: FORMER DoDHF NOVATO, CALIFORNIA	P.E/P.G.: –	ERRG PROJECT NO. 29-059	REVISION NO. 0	SHEET 1 OF 1	FIG NO. 1

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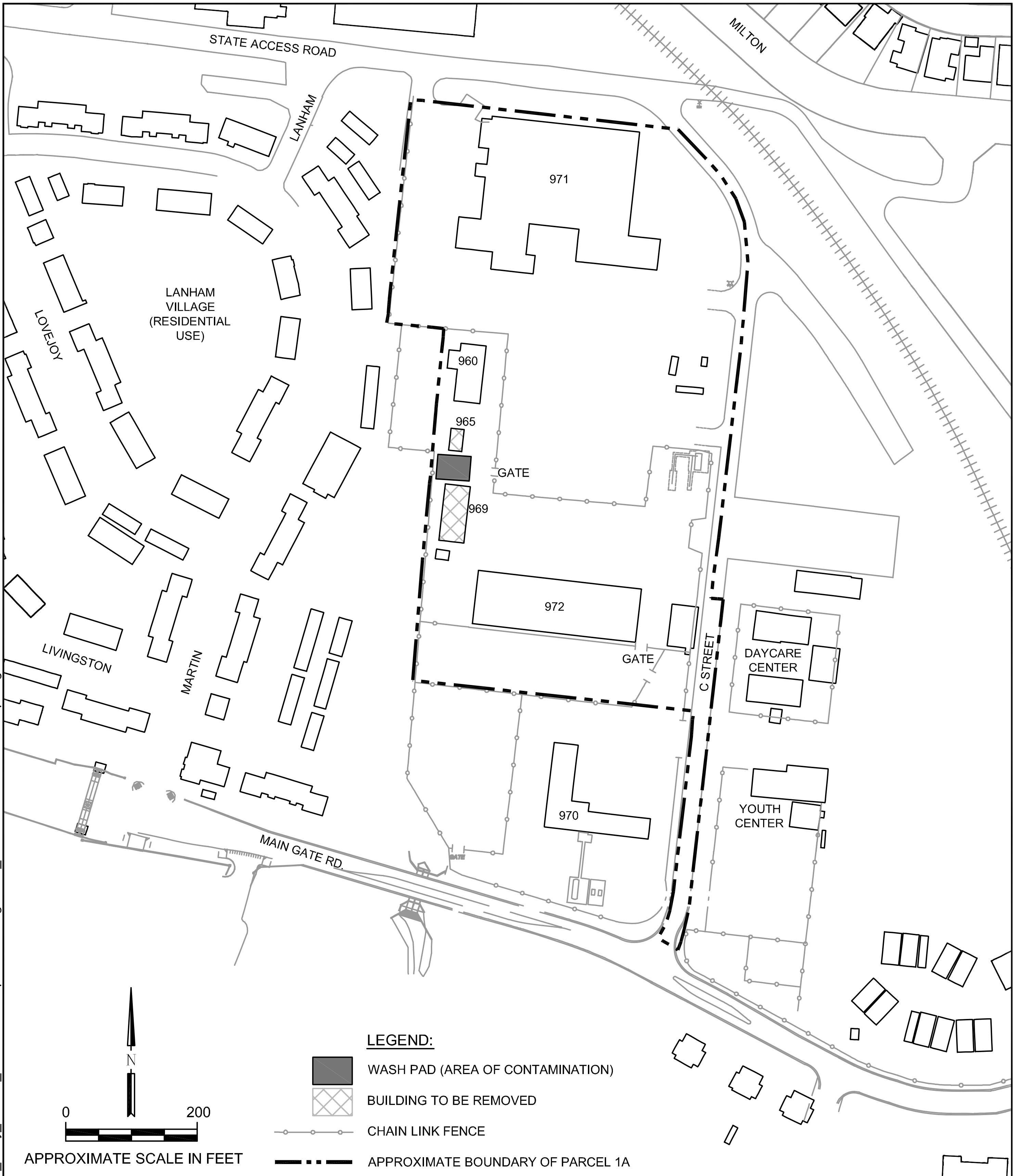


P:\2009_Projects\29-059_Navy_Novato_NTCRA\N. Maps & Drawings\APP_SSHSP\Site Features Map.dwg

ERRG Engineering/Remediation Resources Group, Inc. 115 Sansome St., Suite 200 San Francisco, California 94104 (415) 395-9974	CLIENT: DEPARTMENT OF THE NAVY	DESIGNED BY: VZC 5-11-09	SITE FEATURES MAP				
		CHECKED BY: MB 5-11-09					
	LOCATION: FORMER DoDHF NOVATO, CALIFORNIA	P.E/P.G.: CG 5-11-09	ERRG PROJECT NO. 29-059	REVISION NO. 0	SHEET 1	OF 1	FIG NO. 2

Based on the most recent conceptual site model (presented in Exhibit 1), deeper soils are observed to be relatively impermeable, indicating it is unlikely that significant VOC mass is present in deeper soil gas. In addition, analytical results for shallow and deep soil samples collected in the source area indicated a more pronounced presence of VOCs in shallow soil as opposed to deep soil, indicating a very low subsurface permeability that has resulted in most of the VOC mass being present in shallow soil and serving as a source to soil gas.

The soil and soil gas sampling events described in this SAP will generate data that will be used to:

- quantify the residual concentrations of VOCs in soil and soil gas at the Building 965 Area;
- support the human health risk assessment; and
- support a request for No Further Action (NFA) for the Building 965 Area.

10.1. GEOLOGY AND HYDROLOGY

The site geology is Late Pleisocene to Holocene unconsolidated alluvial materials (i.e., sands, silts, gravels, and clays) encountered in varying portions and depths eroded from the Mendocino Range, located to the west of the former DoDHF Novato. The facility is approximately 9,400 feet west of San Pablo Bay and 4,800 feet south of Ignacio Reservoir (Pacheco Pond). Pacheco Creek is the nearest surface water body to the facility and is located approximately 800 feet to the northwest. The creek flows to the north along the western boarder of the facility in a subsurface culvert, starting from Main Gate Road and ending at the railroad tracks north of the site. Analytical results have indicated that groundwater does not enter the creek along the subsurface culvert. Therefore, the culvert does not serve as a preferential flow path for groundwater. At the railroad tracks, the creek surfaces and flows to the north-northwest into Pacheco Pond and eventually into San Pablo Bay. At the site, bedrock is encountered approximately 15 feet below ground surface (bgs), but increases in depth toward the north. Depth to groundwater is approximately 10 feet bgs, and groundwater does not appear to be contaminated by historical activities that occurred at Building 965 based on results of a recent field investigation of groundwater.

10.2. NATURAL RESOURCES

Shallow groundwater beneath DoDHF Novato is not likely to be used as a potential drinking water source due to the presence of high concentrations of total dissolved solids and low yield. Potable water is already supplied to the area by the municipality (Battelle, 2009).

10.3. ENDANGERED AND SPECIAL STATUS SPECIES

No endangered species are present at DoDHF Novato.

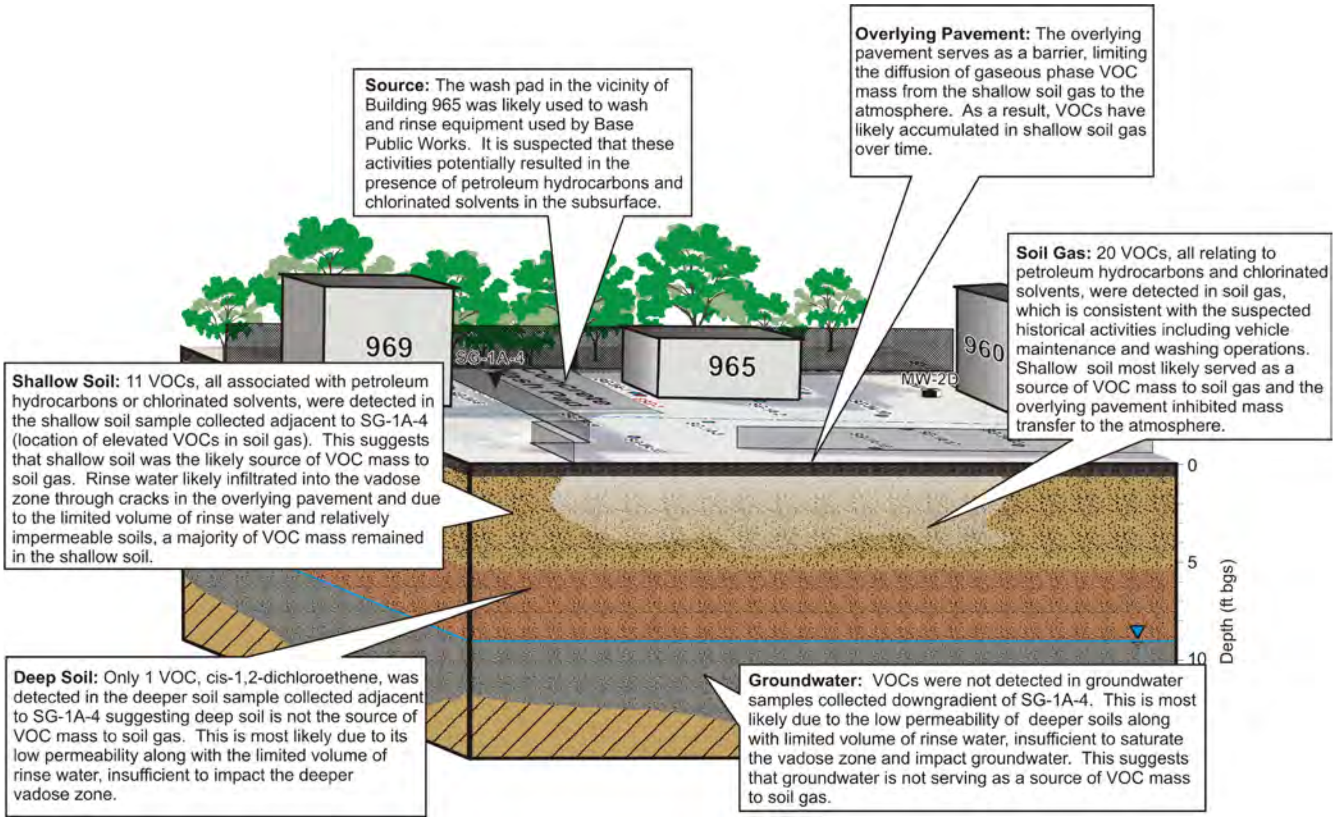


Exhibit 1. Conceptual Site Model

Reference: Battelle, 2009. Personal communication regarding Building 965 conceptual site model. Sent via e-mail from Mr. Ryan Wensink (Battelle) to Ms. Caitlin Gorman (ERRG), April 23.

SAP WORKSHEET #11 – PROJECT QUALITY OBJECTIVES AND SYSTEMATIC PLANNING PROCESS STATEMENTS

EPA's seven-step data quality objective (DQO) process was used during the planning stages for this project. The DQOs for the Building 965 Area are presented in Table 11-1.

Table 11-1. Data Quality Objectives

EPA's seven-step data quality objective (DQO) process was used during the planning stages for this project.

DQO Step	Description
Step 1 State the Problem	Concentrations of VOCs are present in soil gas beneath the wash rack at concentrations that represent a health risk for indoor air. Available information suggests that historical vehicle maintenance and washing operations in the vicinity of Building 965 are likely responsible for concentrations of VOCs present in soil gas (PRC Environmental Management, Inc. 1997). Rinse water likely infiltrated into the vadose zone through small cracks in the overlying concrete and pavement and along a drainage path toward the western edge of the concrete pad. It is likely that rinse water remained in shallow soil due to the limited volume and low permeability of the soils. The overlying pavement likely served as a barrier limiting the diffusion of gaseous phase VOC mass from shallow soil and soil gas to the atmosphere.
Step 2 Identify the Goal of the Study	The primary question to be answered by the sampling event is: ▪ Are VOCs present in post-excavation soil gas samples at concentrations greater than the PALs listed in Worksheet #15.1 following source removal? ▪ Are VOCs present in soil at concentrations greater than the PALs listed in Worksheet #15.2 following source removal?
Step 3 Identify Information Inputs	The inputs to the project decision include: ▪ Concentrations of VOCs in soil gas at selected locations in and around previously detected VOCs. ▪ Validated, defensible analytical data for VOCs (measured by TO-15) from soil gas samples collected as part of this investigation. ▪ Validated, defensible analytical data for VOCs (measured by EPA 8260B) from soil samples collected as part of this investigation.
Step 4 Define the Boundaries of the Study	Horizontal and vertical boundaries of the study are dependent on the sampling network from the previous field investigations and the excavation and the conceptual site model (Worksheet #10). The horizontal boundaries are the farthest extent of soil gas samples collected in the vicinity of Building 965 during the past field investigations in addition to the excavation sidewalls. The project is vertically constrained to the top of groundwater within the excavation area. There are no critical temporal boundaries for this study.
Step 5 Develop the Analytic Approach	The decision rules for the project are: ▪ **IF** validated analytical results for post-excavation soil gas samples indicate that target chemicals are present at concentrations greater than the PALs (see Worksheet #15.1), **THEN** the need for a vapor extraction system for further mitigation will be evaluated; **OTHERWISE,** NFA will be recommended for the site. ▪ **IF** validated analytical results for excavation soil confirmation samples indicate that target chemicals are present at concentrations greater than the PALs (see Worksheet #15.2), **THEN** the need for additional soil excavation will be evaluated. ▪ **IF** validated analytical results for excavation soil confirmation samples indicate target chemicals are not present at concentrations greater than the PALs (see Worksheet #15.2), and **IF** validated analytical results for post-excavation soil gas samples indicate target chemicals are not present at concentrations greater than the PALs (see Worksheet #15.1), **THEN** NFA will be recommended for the site.

Table 11-1. Data Quality Objectives *(continued)*

DQO Step	Description
Step 6 Specify Performance or Acceptance Criteria	Decision errors include data quality and usability. To ensure the quality of the data, it will be reviewed, verified, and undergo a validation process in accordance with Worksheets #34 through #37. To ensure usability of laboratory data, appropriate laboratory methods have been selected to provide the necessary laboratory detection limits. Acceptance criteria for the analytical data are listed in Tables 28-1, 28-2, and 28-3. Field crews will review the final version of this SAP prior to collection of samples and sign off on Worksheet #4. In addition, the laboratory will be provided the final version of this SAP to ensure that all specified requirements are met. Individual sample results will be compared with the PALs to answer the study questions for this project. Acceptance criteria for sampling and analysis are specified in Worksheets #12, 15, and 28. Third-party data validation will be performed on samples as described in Worksheets #29 and 36.
Step 7 Describe the Plan for Obtaining Data	The sampling design and rationale are described in Worksheet #17. In general the sampling design includes the following elements. Following site preparation, five soil gas samples, from five locations, will be collected and analyzed for VOCs to evaluate the immediate effects of removing the asphalt pavement and concrete slab and to provide additional data for the risk assessment. The primary purpose of the proposed excavation is to remove areas of soil gas that pose a risk to the indoor air pathway and soil that may serve as a continuing source to soil gas in the future. Immediately following excavation, 10 soil confirmation samples will be collected and analyzed to ensure that no residual source of VOCs is present in soil remaining on site. Following excavation backfill and site restoration, 22 additional soil gas samples, from 11 locations, will be collected and analyzed from within the excavation footprint and downgradient locations to ensure that no residual soil gas or continuing soil gas source is present. These samples will be collected after the site has been backfilled with clean soil for 30 days. A second round of 22 soil gas samples will be collected from 11 locations after the site has been backfilled with clean soil for at least 90 days.

SAP WORKSHEET #12 – MEASUREMENT PERFORMANCE CRITERIA TABLE

QC Sample	Analytical Group	Frequency	Data Quality Indicators	Measurement Performance Criteria	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Soil Gas					
Field Duplicate	VOCs	10% of samples	Precision	Relative percent difference (RPD) ≤ 25%	S
Trip Blank	VOCs	1 per cooler of samples	Accuracy	No analyte > quantitation limit (QL)	S & A
Soil					
Equipment Blanks[1]	VOCs	1 per sampling day	Accuracy	No analyte > QL	S & A
Trip Blank	VOCs	1 per cooler of samples	Accuracy	No analyte > QL	S & A
Source Blank[2]	VOCs	1 per source	Accuracy	No analyte > QL	S & A

Notes: Soil duplicate samples will not be collected due the inherent variability of the soil matrix.

1 = Equipment blanks will only be collected if non-disposable sampling equipment is used

2 = Water source blank if equipment blanks are collected for non-disposable soil sampling equipment

SAP WORKSHEET #13 – SECONDARY DATA CRITERIA AND LIMITATIONS TABLE

Secondary Data	Data Source (originating organization, report title and date)	Data Generator(s) (originating organization, data types, data generation / collection dates)	How Data Will Be Used	Limitations on Data Use
Soil	Battelle, "Draft Field Activity Summary Report, Investigation of Volatile Organic Compounds at Parcel 1A, Former UST Site 957/970 at the Former Department of Defense Housing Facility, Novato, California." October 2007	Battelle, soil sample data Collection dates: 08/27/07–08/29/07	To determine the horizontal and vertical extent of VOC groundwater contamination in the study area	None
	Battelle, "Preliminary Sampling at Building 965, Department of Defense Housing Facility, Novato, California." April 2008.	Battelle, soil sample data Collection dates: 05/07/08–05/12/08	To determine the horizontal and vertical extent of excavation required to achieve removal action objective (RAO)	None
Soil Gas	Battelle, "Draft Field Activity Summary Report, Investigation of Volatile Organic Compounds at Parcel 1A, Former UST Site 957/970 at the Former Department of Defense Housing Facility, Novato, California." October 2007.	Battelle, soil sample data Collection dates: 08/27/07–08/29/07	To determine the horizontal and vertical extent of VOC groundwater contamination in the study area	None
	Battelle, "Preliminary Sampling at Building 965, Department of Defense Housing Facility, Novato, California." April 2008.	Battelle, soil sample data Collection dates: 05/07/08–05/12/08	To determine the horizontal and vertical extent of excavation required to achieve RAO	None
Groundwater	Battelle, "Draft Field Activity Summary Report, Investigation of Volatile Organic Compounds at Parcel 1A, Former UST Site 957/970 at the Former Department of Defense Housing Facility, Novato, California." October 2007.	Battelle, soil sample data Collection dates: 08/27/07–08/29/07	To determine the horizontal and vertical extent of VOC groundwater contamination in the study area	None
	Battelle, "Preliminary Sampling at Building 965, Department of Defense Housing Facility, Novato, California." April 2008.	Battelle, soil sample data Collection dates: 05/07/08–05/12/08	To determine the horizontal and vertical extent of excavation required to achieve RAO	None

SAP WORKSHEET #14 – SUMMARY OF PROJECT TASKS

Prior to intrusive activities at the site, Underground Service Alert of Northern California will be notified to obtain utility clearance. All pertinent as-built and utility drawings will be reviewed prior to starting any work; however, utility drawings will not be relied on for exact location of utilities, services, laterals, etc. Therefore, a subcontractor will conduct a subsurface utility survey to identify all utilities in close proximity to the excavation area.

The following major tasks are associated with the sampling effort:

- Aboveground structures will be dismantled and removed at the Building 965 Area
- Asphalt pavement and concrete will be removed from within the excavation footprint and surrounding areas
- Soil gas samples and associated QC samples will be collected prior to soil excavation (Reference Number ERRG FS-050 of SAP Worksheet #21)
- Excavate soil beneath former wash pad
- Soil confirmation samples and associated QC samples will be collected from the excavation (Reference Number ERRG FS-051 and ERRG FS-016 of SAP Worksheet #21)
- Soil testing of backfill source as described in Backfill Sampling Procedures subsection below
- Waste samples will be collected as described in Waste Characterization Sampling Procedures subsection below
- Soil sampling documentation (e.g., field book entries and sampling logs) and photographic documentation (Reference Number ERRG FS-001 and ERRG FS-002 of SAP Worksheet #21)
- Decontamination of sampling equipment (Reference Number ERRG FS-010 of SAP Worksheet #21)
- Data management, including data tracking, recording, reduction, analysis, review, validation, storage, and transmittal will be performed (Reference Number ERRG FS-011 of SAP Worksheet #21)
- Sample locations will be surveyed for horizontal location and vertical elevation.
- All investigation-derived waste will be characterized and properly disposed of.
- Soil gas samples and associated QC samples will be collected after the site has been backfilled with clean soil for 30 days and 90 days (Reference Number ERRG FS-050 of SAP Worksheet #21)

14.1. BACKFILL SAMPLING PROCEDURES

Backfill will be analyzed for site-specific chemicals of concern and other chemicals, as recommended in a DTSC advisory (DTSC, 2001), and concentrations will be compared against regulatory acceptance criteria. As per the DTSC advisory, the backfill will also be analyzed for total metals, asbestos, polychlorinated biphenyls, total petroleum hydrocarbons for diesel and motor oil, semivolatile organic compounds, and VOCs. Samples will be collected as follows:

1. Sampling personnel will don a new pair of disposable nitrile gloves immediately before collecting samples.
2. Using a new disposable plastic scoop or equivalent, grab soil samples will be collected into four 8-ounce glass jars.
3. Each container will be labeled, and clear packing tape will be placed over the label to secure it.
4. Sample containers will be custody sealed and packaged in accordance with Worksheet #27.
5. After packaging, samples will be stored in a cooler with sufficient ice (cooler will be approximately half full of wet ice that is below and above sample containers).
6. Field documentation, including field logbooks and COC records, will be filled out during sample collection in accordance with Worksheet #21.

14.2. WASTE CHARACTERIZATION SAMPLING PROCEDURES

Soil and water wastes will be generated during field activities and will require proper disposal. Samples will be collected as follows:

1. Sampling personnel will don a new pair of disposable nitrile gloves immediately before collecting samples at each location.
2. The top of the drum or other approved container will be carefully opened.
3. Using a new disposable plastic scoop or equivalent, four grab soil samples will be collected for every 500 cubic yards, in accordance with landfill requirements.
4. Wastewater samples will be collected using disposable bailers or equivalent into containers.
5. Each container will be labeled and clear packing tape will be placed over the label to secure it.
6. Sample containers will be custody sealed and packaged in accordance with Worksheet #27.
7. After packaging, samples will be stored in a cooler with sufficient ice (cooler will be approximately half full of wet ice that is below and above sample containers).
8. Field documentation including field logbooks and COC records will be filled out during sample collection in accordance with Worksheet #21.

14.3. DECONTAMINATION PROCEDURES

Decontamination of nondisposable sampling equipment that comes in contact with samples (such as the low-flow bladder pump or soil boring sampler) will be performed to prevent the introduction of extraneous material into samples and to prevent cross-contamination between samples. All sampling equipment will be decontaminated by washing with a nonphosphate detergent such as Liquinox™ or equivalent as follows:

1. Dilute the nonphosphate detergent with potable water in a bucket or equivalent as directed by the manufacturer. Wash the equipment with the nonphosphate detergent and potable water solution.
2. Use second bucket with potable water to rinse the equipment.
3. Use third bucket with deionized and distilled water to rinse the equipment again.

Equipment blanks will be collected from a piece of equipment at a frequency of one per day. Laboratory reagent-grade water will be used as an additional rinse after Step 3 of the decontamination procedure described above. Water that is falling from the sampling equipment as it is being rinsed will be collected in appropriate sample bottles for analysis of the same parameters as the field samples.

14.4. ANALYSIS TASKS

Confirmation soil samples will be analyzed by TestAmerica Laboratory in West Sacramento, California. VOCs analyses will be conducted by EPA Method 8260B (EPA, 2008a). Soil gas samples will be analyzed by Air Toxics Ltd. in Folsom, California. VOC analyses will be conducted by EPA Method TO-15 (EPA, 1999). Laboratory personnel will follow the laboratory SOP presented on Worksheet #23 and laboratory protocols detailed on Worksheets #24 and 25.

14.5. QUALITY CONTROL TASKS

Field duplicate samples of soil gas will be collected at a frequency of 1 every 10 primary samples; no field duplicates are required for soil samples, and no equipment rinsates are required for soil gas. Field duplicate samples will be collected at the same time, following the same sampling method, and at the same location as the primary sample. The field duplicate sample will be analyzed for the same analytes (VOCs). Matrix spike and matrix spike duplicate (MS/MSD) samples for soil and soil gas will be collected at a frequency of 1 every 20 field samples. Equipment blanks will be collected from decontaminated non-dedicated sampling equipment (if used). The equipment blank samples will be collected from water poured over the soil sampling equipment. The equipment blank samples will be collected at a rate of one per day that nondedicated sampling equipment is used and analyzed for the same chemicals as the field samples. Trip blanks will be provided by the laboratory and will travel with all coolers carrying soil samples. If equipment blanks are collected, a source blank of the water used will be collected and analyzed for VOCs.

Method blanks, instrument blanks, and laboratory control spike (LCS) will be analyzed at the laboratory in accordance with the analytical method (SW8260B and TO-15). SOPs for sampling tasks and analytical methods will be implemented. Field QC sampling SOPs are presented on Worksheet #21, and Field QC samples are presented on Worksheet #20. In addition, the laboratory SOP is presented on Worksheet #23, and laboratory QC samples are illustrated on Worksheet #28.

14.6. DATA MANAGEMENT PROCEDURES

This subsection discusses the data management tasks for this project for field and laboratory data. Field sampling data, including field logbooks and field forms, will be maintained. The logbooks will be numbered sequentially on the cover by the ERRG QCM, and that number will be entered into a logsheet maintained by the ERRG QCM. A copy of all field forms will be maintained in the project file.

A copy of the COC form will be faxed and e-mailed to the ERRG QCM on a daily basis for review and communication with the laboratory. The manila (bottom) copy of the COC form will be mailed to the ERRG QCM. The ERRG QCM will maintain the manila copy of the COC form until submitted to the DON Administrative Record along with the hardcopy packages, as described in Worksheet #29.

The laboratory will submit data at the turnaround time to ERRG via e-mail. This submittal will include results and basic QC results (method blanks, LCS, surrogates, and MS/MSDs). Following this submittal, the laboratory will be required to submit a Level III- or Level IV-equivalent data package within 20 business days of the sample collection date. For this project, 90 percent of the data will be submitted in an EPA Level III-equivalent data package and 10 percent will be submitted in an EPA Level IV-equivalent data package as listed on the COC form and described in Worksheet #29.

Field data from the COCs (e.g., date and time collected, sample identification, etc.) will be entered into the ERRG database by the ERRG QCM. Survey data will be recorded and also entered into the database. All sample locations, except for waste characterization samples, will be surveyed in accordance with Environmental Work Instruction EVR.6, Environmental Data Management and Required Electronic Delivery Standards (DON, 2005). Horizontal control information will be captured in the State Plane Coordinate System (North American Datum 83) in feet, and vertical control standards will be in mean sea level (North American Vertical Datum 88) in feet. All manual entries into the database will be 100 percent verified by the ERRG QCM by checking the manual entry against the hard copy information.

The laboratory will provide an electronic data deliverable (EDD) that will be compatible with ERRG requirements, and the EDD will be uploaded into the ERRG database. The data will be checked for required values and project-specific requirements by the database. Any discrepancies in the EDD will either be corrected by ERRG or the laboratory will be notified to make corrections.

All analytical data generated from laboratories, except waste characterization data, will be validated by an independent data validation company. The validation report will include the data validation findings worksheets as described in Worksheet #29, and the validation qualifiers will be entered electronically in the laboratory EDD.

Within 30 calendar days of receipt of the validated data, the validation qualifiers will be uploaded into the ERRG database and the electronic data will be submitted to the Naval Installation Restoration Information Solution website in DON Electronic Data Deliverable format in accordance with Environmental Work

Instruction EVR.6, Environmental Data Management and Required Electronic Delivery Standards (DON, 2005).

Hardcopy data will be stored until subsequent submittal to the DON Administrative Record, as described in Worksheet #29. The ERRG database will be electronically backed up on data storage tapes, and the backup will be stored as an archive file.

SAP WORKSHEET #15.1 – REFERENCE LIMITS AND EVALUATION TABLE

Matrix: Soil Gas
Analytical Group: VOCs

Six VOCs (benzene, 1,3-butadiene, cis-1,2-DCE, ethylbenzene, TCE, and vinyl chloride) have been historically detected at the Building 965 Area. Of these, benzene and vinyl chloride were consistently detected in soil gas above RBSLs underneath the wash pad. The VOCs listed below are the primary focus of the sampling effort.

Analyte	Chemical Abstracts Service Number	PAL ($\mu g/m^3$)	PAL Reference[a]	Project Quantitation Limit Goal ($\mu g/m^3$)	Laboratory-Specific	
					Quantitation Limit ($\mu g/m^3$)	Method Detection Limit ($\mu g/m^3$)
Benzene	71-43-2	84	RBSL	42	1.6	0.3
1,3-Butadiene	106-99-0	7.3	RBSL	3.6	1.1	0.3
cis-1,2-DCE	156-59-2	28,100	RBSL	14,000	2.0	0.3
Ethylbenzene	100-41-4	782	RBSL	390	2.2	0.6
TCE	79-01-6	910	RBSL	465	2.7	0.8
Vinyl chloride	75-01-4	20.7	RBSL	10	1.3	0.4

Notes: PALs presented in this SAP are intended for data screening purposes and will be used as preliminary decision criteria for the NTCRA. Final decisions on the need for additional action or site closure will be made following completion of the risk assessment update that will include all existing soil gas data for this site.

a. The project action levels represent site-specific RBSLs that pose an unacceptable risk to indoor air. These action levels were developed using the DTSC Johnson-Ettinger Model and were published in the "Draft Engineering Evaluation/Cost Analysis, Non-Time Critical Removal Action for the Building 965 Area at Parcel 1A, Department of Defense Housing Facility, Novato, California" (Battelle, 2009).

$\mu g/m^3$ = micrograms per cubic meter

SAP WORKSHEET #15.2 – REFERENCE LIMITS AND EVALUATION TABLE

Matrix: Soil

Analytical Group: VOCs

Six VOCs (benzene, 1,3-butadiene, cis-1,2- DCE, ethylbenzene, TCE, and vinyl chloride) have been historically detected at the Building 965 Area. The VOCs listed below are the primary focus of the sampling effort.

Analyte	Chemical Abstracts Service Number	PAL (µg/kg)	PAL Reference[a]	Project Quantitation Limit Goal (µg/kg)	Laboratory-Specific	
					Quantitation Limit (µg/kg)	Method Detection Limit (µg/kg)
Benzene	71-43-2	1,100	EPA RSL	550	5.0	0.26
1,3-Butadiene	106-99-0	54	EPA RSL	27	5.0	0.73
cis-1,2-DCE	156-59-2	780,000	EPA RSL	390,000	5.0	0.89
Ethylbenzene	100-41-4	5,700	EPA RSL	2,850	5.0	0.34
TCE	79-01-6	2,800	EPA RSL	1,400	5.0	0.60
Vinyl chloride	75-01-4	60	EPA RSL	30	5.0	0.36

Notes: PALs presented in this SAP are intended for data screening purposes and will be used as preliminary decision criteria for the NTCRA. Final decisions on the need for additional action or site closure will be made following completion of the risk assessment to be completed following the collection of post-excavation soil gas samples.

a. EPA Region 9 regional screening level (RSL) for residential soil (EPA, 2009).

µg/kg = micrograms per kilogram

SAP WORKSHEET #15.3 – REFERENCE LIMITS AND EVALUATION TABLE

Matrix: Backfill

Analytical Group: VOCs and Gasoline-Range Organics

Analyte	Chemical Abstracts Service Number	PAL (µg/kg)	PAL Reference[a]	Project Quantitation Limit Goal (µg/kg)	Laboratory-Specific	
					Quantitation Limit (µg/kg)	Method Detection Limit (µg/kg)
1,1,1,2-Tetrachloroethane	630-20-6	2,000	EPA RSL	1,000	5	0.41
1,1,1-Trichloroethane	71-55-6	9,000,000	EPA RSL	4,500,000	5	0.36
1,1,2,2-Tetrachloroethane	79-34-5	590	EPA RSL	295	5	0.68
1,1,2-Trichloroethane	79-00-5	1,100	EPA RSL	550	5	0.44
1,1-Dichloroethane	75-34-3	3,400	EPA RSL	1,700	5	0.29
1,1-Dichloroethene	75-35-4	250,000	EPA RSL	125,000	5	0.26
1,1-Dichloropropene	563-58-6	NA	NA	NA	5	0.37
1,2,3-Trichlorobenzene	87-61-6	NA	NA	NA	5	0.75
1,2,3-Trichloropropane	96-18-4	18[b]	EPA RSL	9	5	0.76
1,2,4-Trichlorobenzene	120-82-1	87,000	EPA RSL	43,500	5	0.75
1,2,4-Trimethylbenzene	95-63-6	67,000	EPA RSL	33,500	5	0.51
1,2-Dibromo-3-chloropropane (DBCP)	96-12-8	5.6	EPA RSL	2.8	5	0.88
1,2-Dibromoethane (EDB)	106-93-4	34	EPA RSL	17	10	0.27
1,2-Dichlorobenzene	95-50-1	2,000,000	EPA RSL	1,000,000	5	0.64
1,2-Dichloroethane	107-06-2	450	EPA RSL	225	5	0.73
1,2-Dichloropropane	78-87-5	930	EPA RSL	465	5	0.6
1,3,5-Trimethylbenzene	108-67-8	47,000	EPA RSL	23,500	5	0.35
1,3-Dichlorobenzene	541-73-1	NA	NA	NA	5	0.3

SAP WORKSHEET #15.3 – REFERENCE LIMITS AND EVALUATION TABLE *(continued)*

Analyte	Chemical Abstracts Service Number	PAL (µg/kg)	PAL Reference[a]	Project Quantitation Limit Goal (µg/kg)	Laboratory-Specific Quantitation Limit (µg/kg)	Laboratory-Specific Method Detection Limit (µg/kg)
1,3-Dichloropropane	142-28-9	1,600,000	EPA RSL	800,000	5	0.57
1,4-Dichlorobenzene	106-46-7	2,600	EPA RSL	1,300	5	0.78
2,2-Dichloropropane	594-20-7	NA	NA	NA	5	0.38
2-Butanone (MEK)	78-93-3	28,000,000	EPA RSL	14,000,000	10	1.4
2-Chlorotoluene	95-49-8	1,600,000	EPA RSL	800,000	5	0.62
2-Hexanone	591-78-6	NA	NA	NA	10	0.74
4-Chlorotoluene	106-43-4	5,500,000	EPA RSL	2,750,000	5	0.86
4-Methyl-2-pentanone (MIBK)	108-10-1	5,300,000	EPA RSL	2,650,000	10	0.92
Acetone	67-64-1	61,000,000	EPA RSL	30,500,000	20	1.4
Bromobenzene	108-86-1	94,000	EPA RSL	47,000	5	0.52
Bromochloromethane	74-97-5	NA	NA	NA	5	0.94
Bromodichloromethane	75-27-4	280	EPA RSL	140	5	0.53
Bromoform	75-25-2	61,000	EPA RSL	30,500	5	0.4
Bromomethane	74-83-9	7,900	EPA RSL	3,950	5	0.86
Carbon disulfide	75-15-0	670,000	EPA RSL	335,000	10	0.49
Carbon tetrachloride	56-23-5	250	EPA RSL	125	5	0.53
Chlorobenzene	108-90-7	310,000	EPA RSL	155,000	5	0.29
Chloroethane	75-00-3	15,000,000	EPA RSL	7,500,000	5	0.45
Chloroform	67-66-3	300	EPA RSL	150	5	0.26
Chloromethane	74-97-3	120,000	EPA RSL	60,000	5	0.5

SAP WORKSHEET #15.3 – REFERENCE LIMITS AND EVALUATION TABLE *(continued)*

Analyte	Chemical Abstracts Service Number	PAL (µg/kg)	PAL Reference[a]	Project Quantitation Limit Goal (µg/kg)	Laboratory-Specific	
					Quantitation Limit (µg/kg)	Method Detection Limit (µg/kg)
cis-1,3-Dichloropropene	10061-01-5	170	EPA RSL	85	5	0.64
Dibromochloromethane	124-48-1	700	EPA RSL	350	5	0.21
Dibromomethane	74-95-3	780,000	EPA RSL	390,000	5	0.58
Dichlorodifluoromethane (Freon 12)	75-71-8	190,000	EPA RSL	95,000	5	0.89
Hexachlorobutadiene	87-68-3	6,200	EPA RSL	3,100	5	0.33
Isopropylbenzene	98-82-8	2,200,000	EPA RSL	1,100,000	5	0.52
Methyl tert-butyl ether (MTBE)	1634-04-4	39,000	EPA RSL	19,500	10	0.6
Methylene chloride	75-09-2	11,000	EPA RSL	5,500	5	0.84
m-Xylene & p-Xylene	136777-61-2	9,200	EPA RSL	4,100	5	0.81
Naphthalene	91-20-3	3,900	EPA RSL	1,950	5	0.63
n-Butylbenzene	104-51-8	NA	NA	NA	5	0.66
n-Propylbenzene	103-65-1	NA	NA	NA	5	0.29
o-Xylene	95-47-6	5,300,000	EPA RSL	2,650,000	5	0.33
p-Isopropyltoluene	99-87-6	NA	NA	NA	5	0.63
sec-Butylbenzene	135-98-8	NA	NA	NA	5	0.75
Styrene	100-42-5	6,500,000	EPA RSL	3,250,000	5	0.31
tert-Butylbenzene	98-06-6	NA	NA	NA	5	0.54
Tetrachloroethene	127-18-4	570	EPA RSL	285	5	0.61
Toluene	108-88-3	5,000,000	EPA RSL	2,500,000	5	0.61
trans-1,2-Dichloroethene	156-60-5	110,000	EPA RSL	55,000	5	0.38

SAP WORKSHEET #15.3 – REFERENCE LIMITS AND EVALUATION TABLE *(continued)*

Analyte	Chemical Abstracts Service Number	PAL (µg/kg)	PAL Reference[a]	Project Quantitation Limit Goal (µg/kg)	Laboratory-Specific	
					Quantitation Limit (µg/kg)	Method Detection Limit (µg/kg)
trans-1,3-Dichloropropene	10061-02-6	1,700	EPA RSL	850	5	0.75
Trichlorofluoromethane (Freon 11)	75-69-4	800,000	EPA RSL	400,000	10	0.34
Gasoline-Range Organics	NA	NA	NA	NA	500	50

Notes: PALs presented in this SAP are intended for data screening purposes and will be used as preliminary decision criteria for the NTCRA. Final decisions on the need for additional action or site closure will be made following completion of the risk assessment to be completed following the collection of post-excavation soil gas samples.

a. EPA Region 9 regional screening level (RSL) for residential soil (EPA, 2009).

b. DTSC, 2009

NA = not applicable

µg/kg = micrograms per kilogram

SAP WORKSHEET #15.4 – REFERENCE LIMITS AND EVALUATION TABLE

Matrix: Backfill

Analytical Group: Semivolatile organic compounds (SVOCs)

Analyte	Chemical Abstracts Service Number	PAL (µg/kg)	PAL Reference[a]	Project Quantitation Limit Goal (µg/kg)	Laboratory-Specific	
					Quantitation Limit (µg/kg)	Method Detection Limit (µg/kg)
1,2,4-Trichlorobenzene	120-82-1	87,000	EPA RSL	43,500	330	83
1,2-Dichlorobenzene	95-50-1	2,000,000	EPA RSL	1,000,000	330	75
1,3-Dichlorobenzene	541-73-1	NA	NA	NA	330	78
1,4-Dichlorobenzene	106-46-7	2,600	EPA RSL	1,300	330	77
2,4,5-Trichlorophenol	95-95-4	6,100,000	EPA RSL	3,050,000	330	83
2,4,6-Trichlorophenol	88-06-2	44,000	EPA RSL	22,000	330	84
2,4-Dichlorophenol	120-83-2	180,000	EPA RSL	90,000	330	89
2,4-Dimethylphenol	105-67-9	1,200,000	EPA RSL	600,000	330	167
2,4-Dinitrophenol	51-28-5	120,000	EPA RSL	60,000	2,000	214
2,4-Dinitrotoluene	121-14-2	1,600	EPA RSL	800	330	89
2,6-Dinitrophenol	87-65-0	NA	NA	NA	500	165
2,6-Dinitrotoluene	606-20-2	61,000	EPA RSL	30,500	330	99
2-Chloronaphthalene	91-58-7	6,300,000	EPA RSL	3,150,000	330	81
2-Chlorophenol	95-57-8	390,000	EPA RSL	195,000	330	88
2-Methylnaphthalene	91-57-6	310,000	EPA RSL	155,000	330	85
2-Methylphenol	95-48-7	3,100,000	EPA RSL	1,550,000	330	58
2-Nitroaniline	88-74-4	180,000	EPA RSL	90,000	1,600	84
2-Nitrophenol	88-75-5	NA	NA	NA	330	82

SAP WORKSHEET #15.4 – REFERENCE LIMITS AND EVALUATION TABLE *(continued)*

Analyte	Chemical Abstracts Service Number	PAL (µg/kg)	PAL Reference[a]	Project Quantitation Limit Goal (µg/kg)	Laboratory-Specific Quantitation Limit (µg/kg)	Laboratory-Specific Method Detection Limit (µg/kg)
3,3'-Dichlorobenzidine	91-94-1	1,100	EPA RSL	550	1,600	94[b]
3-Methylphenol and 4-Methylphenol	65794-96-9	NA	NA	NA	1,000	330
3-Nitroaniline	99-09-2	NA	NA	NA	1,600	167
4,5-Dinitro-2-methylphenol	534-52-1	6,100	EPA RSL	3,050	2,000	81
4-Bromophenyl phenyl ether	101-55-3	NA	NA	NA	330	85
4-Chloro-3-methylphenol	59-50-7	NA	NA	NA	330	92
4-Chloroaniline	106-47-8	2,400	EPA RSL	1,200	330	58
4-Chlorophenyl phenyl ether	7005-72-3	NA	NA	NA	330	93
4-Nitroaniline	100-01-6	24,000	EPA RSL	12,000	1,600	88
4-Nitrophenol	100-02-7	NA	NA	NA	2,000	280
Acenaphthene	83-32-9	3,400,000	EPA RSL	1,700,000	330	83
Acenaphthylene	208-96-8	NA	NA	NA	330	85
Anthracene	120-12-7	17,000,000	EPA RSL	8,500,000	330	86
Azobenzene	103-33-3	4,900	EPA RSL	2,450	330	92
Benzo(a)anthracene[c]	56-55-3	150	EPA RSL	75	5.0	0.30
Benzo(a)pyrene[c]	50-32-8	15	EPA RSL	7.5	5.0	0.40
Benzo(b)fluoranthene[c]	205-99-2	150	EPA RSL	75	5.0	0.50
Benzo(g,h,i)perylene	191-24-2	NA	NA	NA	330	110
Benzo(k)fluoranthene	207-08-9	1,500	EPA RSL	750	330	113
Benzoic acid	65-85-0	240,000,000	EPA RSL	120,000,000	1,600	289
Benzyl alcohol	100-51-6	31,000,000	EPA RSL	15,500,000	510	170

SAP WORKSHEET #15.4 – REFERENCE LIMITS AND EVALUATION TABLE *(continued)*

Analyte	Chemical Abstracts Service Number	PAL (µg/kg)	PAL Reference[a]	Project Quantitation Limit Goal (µg/kg)	Laboratory-Specific	
					Quantitation Limit (µg/kg)	Method Detection Limit (µg/kg)
Bis(2-chloroethoxy)methane	111-91-1	180,000	EPA RSL	90,000	330	88
Bis(2-chloroethyl)ether	111-44-4	190	EPA RSL	95	330	81[b]
Bis(2-chloroisopropyl)ether	108-60-1	3,500	EPA RSL	1,750	330	79
Bis(2-ethylhexyl)phthalate	117-81-7	35,000	EPA RSL	17,500	330	98
Butylbenzylphthalate	85-68-7	260,000	EPA RSL	130,000	330	95
Carbazole	86-74-8	NA	NA	NA	330	95
Chrysene	218-01-9	15,000	EPA RSL	7,500	330	84
Dibenz(a,h)anthracene[c]	53-70-3	15	EPA RSL	7.5	5.0	1.2
Dibenzofuran	132-64-9	NA	NA	NA	330	86
Diethylphthalate	84-66-2	49,000,000	EPA RSL	24,500,000	330	90
Dimethylphthalate	131-11-3	NA	NA	NA	330	87
Di-n-butylphthalate	84-74-2	6,100,000	EPA RSL	3,050,000	330	97
Di-n-octylphthalate	117-84-0	NA	NA	NA	330	97
Fluoranthene	206-44-0	2,300,000	EPA RSL	1,150,000	330	95
Fluorene	86-73-7	2,300,000	EPA RSL	1,150,000	330	92
Hexachlorobenzene	118-74-1	300	EPA RSL	150	330	89[b]
Hexachlorobutadiene	87-68-3	6,200	EPA RSL	3,100	330	82
Hexachloroethane	67-72-1	35,000	EPA RSL	17,500	330	81
Indeno(1,2,3-cd)pyrene[c]	193-39-5	150	EPA RSL	75	5.0	0.48
Isophorone	78-59-1	510,000	EPA RSL	255,000	330	93
Naphthalene	91-20-3	3,900	EPA RSL	1,950	330	82

SAP WORKSHEET #15.4 – REFERENCE LIMITS AND EVALUATION TABLE *(continued)*

Analyte	Chemical Abstracts Service Number	PAL (µg/kg)	PAL Reference[a]	Project Quantitation Limit Goal (µg/kg)	Laboratory-Specific	
					Quantitation Limit (µg/kg)	Method Detection Limit (µg/kg)
Nitrobenzene	98-95-3	4,400	EPA RSL	2,200	330	76
n-Nitrosodiphenylamine	86-30-6	99,000	EPA RSL	49,500	330	86
n-Nitrosopyrrolidine	930-55-2	230	EPA RSL	115	500	165[b]
Pentachlorophenol	87-86-5	3,000	EPA RSL	1,500	330	51
Phenanthrene	85-01-8	NA	NA	NA	330	94
Phenol	108-95-2	18,000,000	EPA RSL	9,000,000	330	83
Pyrene	129-00-0	1,700,000	EPA RSL	850,000	330	94

Notes: PALs presented in this SAP are intended for data screening purposes and will be used as preliminary decision criteria for the NTCRA. Final decisions on the need for additional action or site closure will be made following completion of the risk assessment to be completed following the collection of post-excavation soil gas samples.

a. EPA Region 9 regional screening level (RSL) for residential soil (EPA, 2009).

b. For these analytes where the quantitation limit exceeds the PAL, the laboratory will report detections to the method detection limit.

c. Analyte analyzed by EPA Method 8270C Selected Ion Monitoring (SIM) to achieve quantitation limit and method detection limit lower than PAL.

NA = not applicable

µg/kg = micrograms per kilogram

SAP WORKSHEET #15.5 – REFERENCE LIMITS AND EVALUATION TABLE

Matrix: Backfill

Analytical Group: polychlorinated biphenyls (PCBs)

Analyte	Chemical Abstracts Service Number	PAL (µg/kg)	PAL Reference[a]	Project Quantitation Limit Goal (µg/kg)	Laboratory-Specific	
					Quantitation Limit (µg/kg)	Method Detection Limit (µg/kg)
Aroclor-1016	12674-11-2	3,900	EPA RSL	1,700	33	8.3
Aroclor-1221	11104-28-2	170	EPA RSL	85	33	11
Aroclor-1232	11141-16-5	170	EPA RSL	85	33	8.3
Aroclor-1242	53469-21-9	220	EPA RSL	110	33	8.3
Aroclor-1248	12672-29-6	220	EPA RSL	110	33	8.3
Aroclor-1254	11097-69-1	220	EPA RSL	110	33	8.3
Aroclor-1260	11096-82-5	220	EPA RSL	110	33	8.3

Notes: PALs presented in this SAP are intended for data screening purposes and will be used as preliminary decision criteria for the NTCRA. Final decisions on the need for additional action or site closure will be made following completion of the risk assessment to be completed following the collection of post-excavation soil gas samples.

a. EPA Region 9 regional screening level (RSL) for residential soil (EPA, 2009).

µg/kg = micrograms per kilogram

SAP WORKSHEET #15.6 – REFERENCE LIMITS AND EVALUATION TABLE

Matrix: Backfill

Analytical Group: Diesel-Range Organics

Analyte	Chemical Abstracts Service Number	PAL (µg/kg)	PAL Reference	Project Quantitation Limit Goal (µg/kg)	Laboratory-Specific	
					Quantitation Limit (µg/kg)	Method Detection Limit (µg/kg)
Diesel-Range Organics	NA	NA	NA	NA	1	0.3

Notes:
NA = not applicable
µg/kg = micrograms per kilogram

SAP WORKSHEET #15.7 – REFERENCE LIMITS AND EVALUATION TABLE

Matrix: Backfill

Analytical Group: Metals

Analyte	Chemical Abstracts Service Number	PAL (mg/kg)	PAL Reference	Project Quantitation Limit Goal (mg/kg)	Laboratory-Specific	
					Quantitation Limit (mg/kg)	Method Detection Limit (mg/kg)
Aluminum	7429-90-5	77,000	EPA RSL[a]	38,000	20	5.6
Antimony	7440-36-0	31	EPA RSL[a]	15	3	0.94
Arsenic	7440-38-2	10.8	Former DoDHF Novato Background[b]	5.4	4	1.3
Barium	7440-39-3	15,000	EPA RSL[a]	7,500	2	0.4
Beryllium	7440-41-7	160	EPA RSL[a]	80	0.3	0.1
Cadmium	7440-43-9	790	EPA RSL[a]	390	0.3	0.1
Calcium	7440-70-2	NA	NA	NA	100	25
Chromium	7440-47-3	280	EPA RSL[a]	140	1	0.33
Cobalt	7440-48-4	370	EPA RSL[a]	180	0.6	0.25
Copper	7440-50-8	3,100	EPA RSL[a]	1,500	2.5	0.5
Iron	7439-89-6	55,000	EPA RSL[a]	27,000	10	3.1
Lead	7439-92-1	150[c]	EPA RSL[a]	75	1	0.33
Magnesium	7439-95-4	16,997	Former DoDHF Novato Background[b]	8,498.5	50	7.5
Manganese	7439-96-5	1,800	EPA RSL[a]	900	1	0.33
Mercury	7439-97-6	4.3	EPA RSL[a]	2.2	0.04	0.00858
Molybdenum	7439-98-7	390	EPA RSL[a]	200	3	1

SAP WORKSHEET #15.7 – REFERENCE LIMITS AND EVALUATION TABLE *(continued)*

Analyte	Chemical Abstracts Service Number	PAL (mg/kg)	PAL Reference	Project Quantitation Limit Goal (mg/kg)	Laboratory-Specific	
					Quantitation Limit (mg/kg)	Method Detection Limit (mg/kg)
Nickel	7440-02-0	13,000	EPA RSL[a]	6,500	1	0.3
Potassium	7440-09-7	6,848	Former DoDHF Novato Background[b]	3,424	100	25
Selenium	7782-49-2	390	EPA RSL[a]	200	3	1.4
Silver	7440-22-4	390	EPA RSL[a]	200	0.5	0.1
Sodium	7440-23-5	NA	NA	NA	500	25
Thallium	7440-28-0	5.1	EPA RSL[a]	2.6	3	0.84
Vanadium	7440-62-2	550	EPA RSL[a]	280	2	0.3
Zinc	7440-66-6	23,000	EPA RSL[a]	11,000	3	0.6

Notes: PALs presented in this SAP are intended for data screening purposes and will be used as preliminary decision criteria for the NTCRA. Final decisions on the need for additional action or site closure will be made following completion of the risk assessment to be completed following the collection of post-excavation soil gas samples.

a. EPA Region 9 regional screening level (RSL) for residential soil (EPA, 2009).

b. Background metal concentrations in soil from the “Final Environmental Baseline Survey Sampling and Analysis Screening Level Report” for the Former DoDHF Novato, dated April 15, 1997. Background metal concentrations were used as screening criteria for analytes where the background concentration was greater than the EPA RSL.

c. DTSC, 2009

NA = not applicable

mg/kg = milligrams per kilogram

SAP WORKSHEET #16 – PROJECT SCHEDULE AND TIMELINE TABLE

Activities	Organization	Anticipated Date(s) of Initiation	Anticipated Date of Completion	Deliverable	Deliverable Due Date
Prepare and Submit Internal Draft SAP	ERRG	4-22-2009	6-17-2009	Draft SAP	6-17-2009
Receive DON Comments	BRAC PMO West and NAVFAC SW	6-17-2009	7-7-2009	DON Comments	NA
Submit Draft SAP to Regulatory Agencies	BRAC PMO West and NAVFAC SW, DTSC, and SFRWQCB	8-5-2009	8-27-2009	Draft SAP	8-27-2009
Regulatory Agencies review Draft SAP	DTSC and SFRWQCB	8-5-2009	8-24-2009	Draft SAP	8-24-2009
Prepare and submit Final SAP to NAVFAC SW and Regulatory Agencies	BRAC PMO West and NAVFAC SW, DTSC, and SFRWQCB	8-24-2009	10-20-2009	Final SAP	10-15-2009
Perform Fieldwork	ERRG	10-26-2009	12-15-2009	None	NA
Prepare and Submit Draft and Final After Action Summary Report	ERRG	12-15-2009	2-22-2010	Report	2-22-2010
Prepare and Submit Draft and Final NFA Letter	ERRG	4-5-2010	4-15-2010	Letter	4-15-2010

SAP WORKSHEET #17 – SAMPLING DESIGN AND RATIONALE

The sampling approach involves the collection of soil gas samples at the Building 965 Area. Summa canister sampling techniques will be used to collect the samples. Summa canisters have excellent surface inertness, do not require a pump, have a long hold time to analysis, and are rugged for shipping. The sampling procedures are detailed in Worksheet #21.

Sampling will include (1) collection of pre-excavation soil gas samples; (2) collection of excavation soil confirmation samples; and (3) collection of post-excavation soil gas samples. The sampling scheme is designed to confirm the presence and degradation or absence of VOCs at the Building 965 Area.

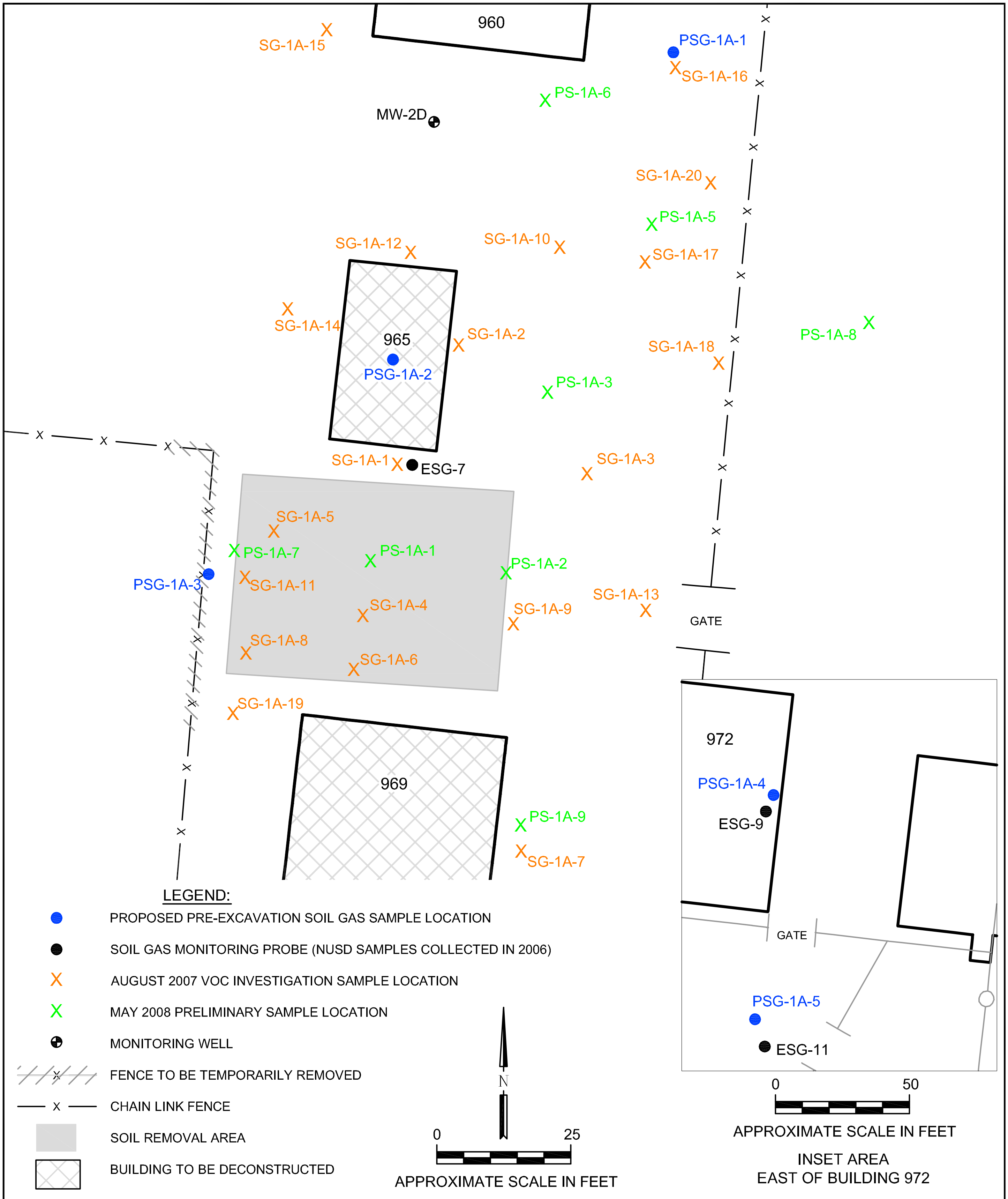
Following pavement removal and prior to excavation activities, five soil gas samples will be collected from fixed monitoring locations to be installed via direct-push drilling prior to soil excavation (Figure 3).

Following excavation activities, ERRG will collect soil samples to confirm that no continuing source of VOCs is present in soil remaining at the site. Soil confirmation sample results will be screened against the PALs to determine whether further action (including additional soil excavation) is necessary. If concentrations of VOCs in soil exceed PALs, additional soil will be excavated until results of the confirmation samples indicate VOCs are below PALs. The screening of soil samples against PALs will be used as preliminary decision criteria for the NTCRA. Final decisions on the need for additional action or site closure will be made following completion of the final risk assessment, which will incorporate the results of post-excavation soil gas samples and fully evaluate the potential future site risk. This approach (PAL screening followed by risk assessment) will confirm that the excavation has reduced the risk to human health at the site to acceptable levels, so that site closure can be achieved, and will ensure proper restoration of the area, so that Parcel 1A is suitable for property transfer to the NUSD (Battelle, 2009).

In total, 10 soil confirmation samples will be collected from the excavation (bottom and sidewalls), as shown on Figure 4. The soil samples will be collected from discrete locations between the ground surface and approximately 10 feet bgs that are representative of both the upper 5 feet (relatively high-permeability material) and the underlying (less permeable) material, in accordance with SOP FS-051 (see Worksheet #21). The samples to be analyzed for VOCs will be collected from undisturbed material using an Encore® sampler, in accordance with SOP FS-016. Field and laboratory QC samples will be collected to assess the quality of the analytical data in accordance with Worksheets #20 and #28.

ERRG will also collect four grab soil samples from the backfill source material to confirm that it does not contain chemicals of concern at levels exceeding DTSC specifications, and meets the requirements for clean backfill as described in a DTSC advisory (DTSC, 2001).

Following excavation and backfill, soil gas samples will be collected from 11 fixed monitoring points to be installed via direct-push drilling (Figure 5). Twenty-two samples from the fixed monitoring points will be collected 30 days after placement of clean backfill to allow for possible soil gas rebound. Twenty-two additional samples will also be collected from the same locations as the first round of post-excavation soil gas confirmation samples, 90 days after the site has been backfilled with clean soil. These sample locations were selected based on historic data indicating that VOC contamination was found in the wells, and to obtain additional data where none exists to support the update of the existing risk assessment. Field and laboratory QC samples will be collected to assess the quality of the analytical data in accordance with Worksheets #20 and #28.



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Engineering/Remediation Resources Group, Inc.
115 Sansome St., Suite 200
San Francisco, California 94104
(415) 395-9974
ERRG

CLIENT: DEPARTMENT OF THE NAVY

LOCATION: FORMER DoDHF NOVATO, CALIFORNIA

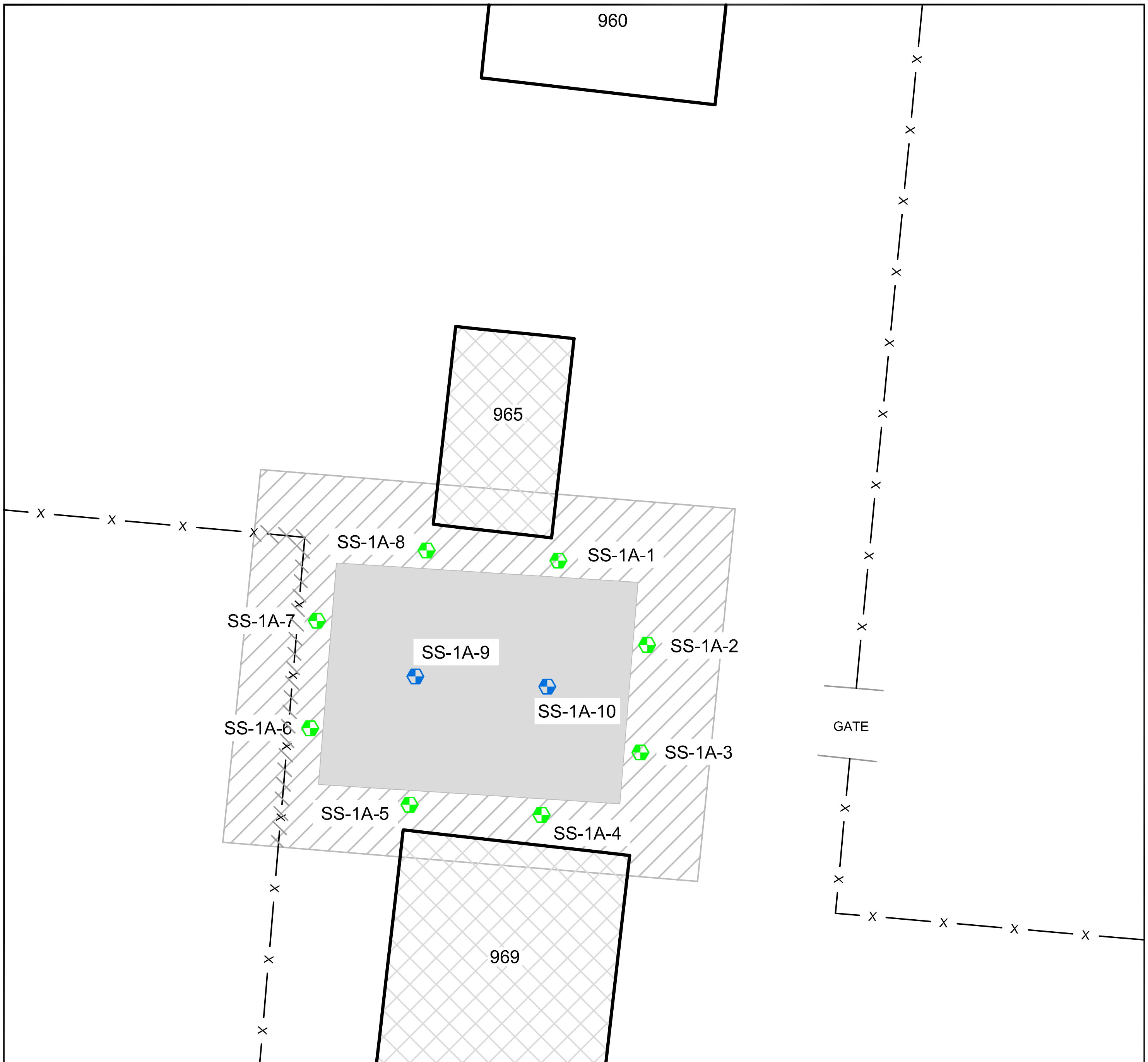
DESIGNED BY: VZC 5-21-09

CHECKED BY: MB 5-21-09

P.E/P.G.: CG 5-21-09

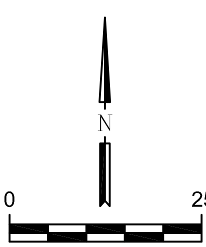
PROPOSED PRE-EXCAVATION SOIL GAS SAMPLING LOCATIONS

ERRG PROJECT NO.	REVISION NO.	SHEET	OF	FIG NO.
29-059	0	1	1	3



LEGEND:

- SOIL CONFIRMATION SAMPLE LOCATION (SIDE WALL)
- SOIL CONFIRMATION SAMPLE LOCATION (BOTTOM)
- BUILDING TO BE DECONSTRUCTED
- AREA OF PROTECTIVE SLOPING
- CHAIN LINK FENCE
- SOIL REMOVAL AREA
- FENCE TO BE TEMPORARILY REMOVED



APPROXIMATE SCALE IN FEET

ERRG
Engineering/Remediation Resources Group, Inc.
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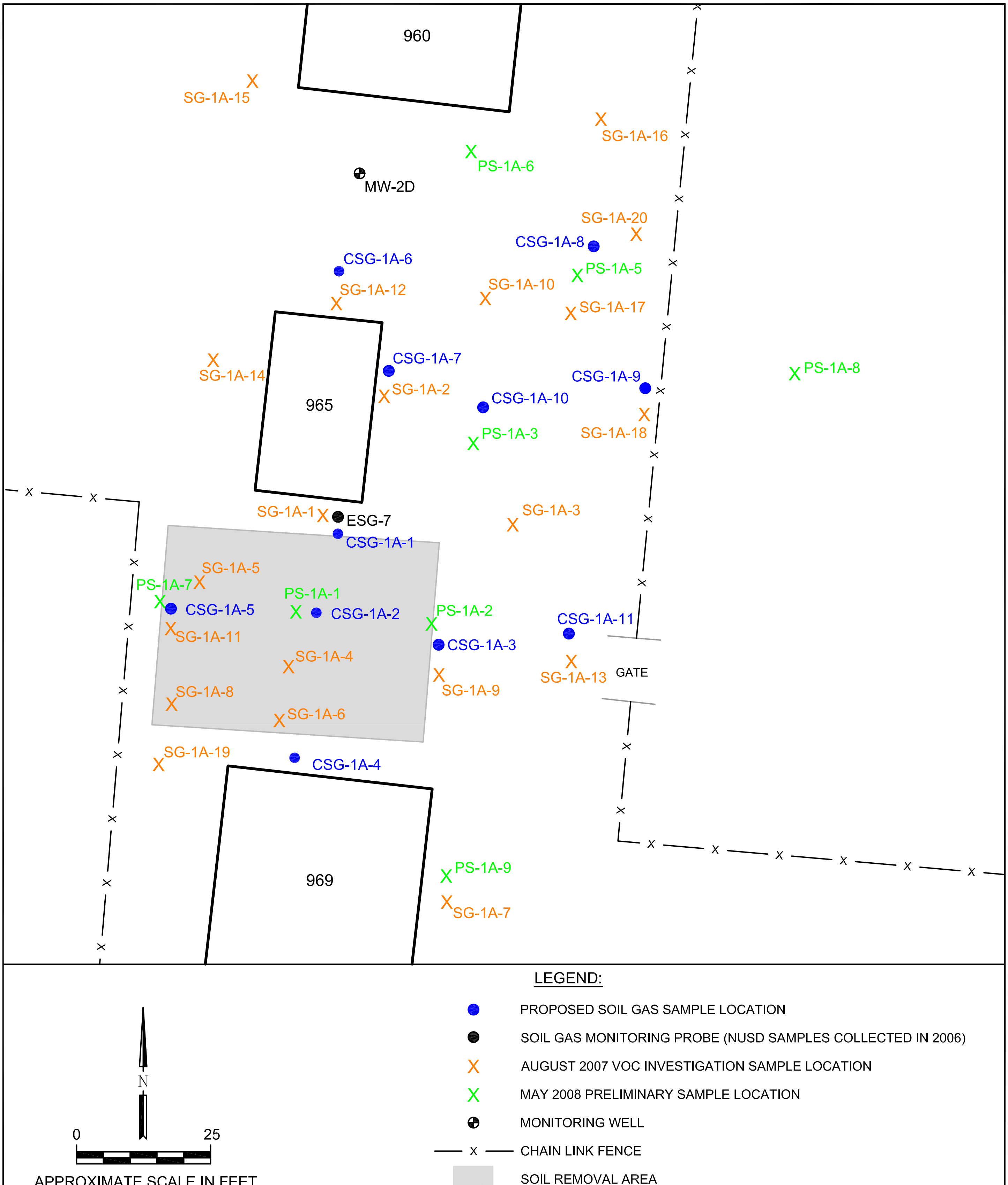
San Francisco, California 94104
(415) 395-9974

CLIENT: DEPARTMENT OF THE NAVY	DESIGNED BY: VZC 5-21-09	POST-EXCAVATION SOIL CONFIRMATION SAMPLE LOCATIONS				
LOCATION: FORMER DoDHF NOVATO, CALIFORNIA	CHECKED BY: MB 5-21-09					
	P.E/P.G.: CG 5-21-09	ERRG PROJECT NO. 29-059	REVISION NO. 0	SHEET 1	OF 1	FIG NO. 4

P:\2009_Projects\29-059_Navy_Novato_NTCRAIN. Maps & Drawings\SAP\Post-Excavation Soil Confirmation Sample .dwg



LEGEND:

- PROPOSED SOIL GAS SAMPLE LOCATION
- SOIL GAS MONITORING PROBE (NUSD SAMPLES COLLECTED IN 2006)
- AUGUST 2007 VOC INVESTIGATION SAMPLE LOCATION
- MAY 2008 PRELIMINARY SAMPLE LOCATION
- MONITORING WELL
- CHAIN LINK FENCE
- SOIL REMOVAL AREA

P:\2009_Projects\29-059_Navy_Novato_NTCRAIN. Maps & Drawings\Proposed Post-Excavation Soil Gas Sampling Locations .dwg

ERRG Engineering/Remediation Resources Group, Inc. 115 Sansome St., Suite 200 San Francisco, California 94104 (415) 395-9974	CLIENT: DEPARTMENT OF THE NAVY	DESIGNED BY: VZC 5-21-09	PROPOSED POST-EXCAVATION SOIL GAS SAMPLING LOCATIONS			
	LOCATION: FORMER DoDHF NOVATO, CALIFORNIA	CHECKED BY: MB 5-29-09				
		P.E/P.G.: CG 5-29-09	ERRG PROJECT NO. 29-059	REVISION NO. 0	SHEET 1 OF 1	FIG NO. 5

SAP WORKSHEET #18.1 – SAMPLING LOCATIONS, METHODS, AND SOP REQUIREMENTS TABLE FOR PRE-EXCAVATION SOIL GAS SAMPLING

Sampling Location ID Number	Sample ID Number	Matrix	Depth (feet bgs)[1]	Analytical Group	Number of Samples	Sampling SOP Reference	Rationale for Sampling Location
PSG-1A-1	PSG-1A-1 (6.0)	Soil Gas	4 to 6	VOCs[1]	1	ERRG FS-050	Evaluate ethylbenzene concentration, as well as other chemicals of concern in soil gas, where ethylbenzene concentration exceeding the RBSL was previously detected at SG-1A-16
PSG-1A-2	PSG-1A-2 (6.0)	Soil Gas	4 to 6		1	ERRG FS-050	Evaluate VOC concentrations in soil gas beneath Building 965 because no samples were collected beneath the building during past sampling events
PSG-1A-3	PSG-1A-3 (6.0)	Soil Gas	4 to 6		1	ERRG FS-050	Evaluate VOC concentrations along the property boundary because no samples were collected along the boundary of DON and adjacent property during past sampling events
PSG-1A-4	PSG-1A-4 (6.0)	Soil Gas	4 to 6		1	ERRG FS-050	Evaluate VOC concentrations in soil gas where inconsistent data exist at ESG-9
PSG-1A-5	PSG-1A-5 (6.0)	Soil Gas	4 to 6		1	ERRG FS-050	Evaluate VOC concentrations in soil gas where inconsistent data exist at ESG-11

Notes:

1. VOCs by EPA Method TO-15 (EPA, 1999)

SAP WORKSHEET #18.2 – SAMPLING LOCATIONS, METHODS, AND SOP REQUIREMENTS TABLE FOR EXCAVATION SOIL SAMPLING

Sampling Location ID Number	Sample ID Number	Matrix	Depth (feet bgs)[1]	Analytical Group	Number of Samples	Sampling SOP Reference	Rationale for Sampling Location
SS-1A-1	SS-1A-01 (4.0)	Soil	4	VOCs[1]	1	ERRG FS-016	Sample is located in relatively high-permeability material; confirm source of VOCs is no longer present within the excavation footprint
SS-1A-2	SS-1A-02 (4.0)	Soil	4		1	ERRG FS-016	Sample is located in relatively high-permeability material; confirm source of VOCs is no longer present within the excavation footprint
SS-1A-3	SS-1A-03 (4.0)	Soil	4		1	ERRG FS-016	Sample is located in relatively high-permeability material; confirm source of VOCs is no longer present within the excavation footprint
SS-1A-4	SS-1A-04 (4.0)	Soil	4		1	ERRG FS-016	Sample is located in relatively high-permeability material; confirm source of VOCs is no longer present within the excavation footprint
SS-1A-5	SS-1A-05 (7.0)	Soil	7		1	ERRG FS-016	Sample is located in underlying (less permeable) material; confirm source of VOCs is no longer present within the excavation footprint
SS-1A-6	SS-1A-06 (7.0)	Soil	7		1	ERRG FS-016	Sample is located in underlying (less permeable) material; confirm source of VOCs is no longer present within the excavation footprint
SS-1A-7	SS-1A-07 (7.0)	Soil	7		1	ERRG FS-016	Sample is located in underlying (less permeable) material; confirm source of VOCs is no longer present within the excavation footprint
SS-1A-8	SS-1A-08 (7.0)	Soil	7		1	ERRG FS-016	Sample is located in underlying (less permeable) material; confirm source of VOCs is no longer present within the excavation footprint
SS-1A-9	SS-1A-09 (10.0)	Soil	10		1	ERRG FS-016	Sample is located in the bottom of the excavation; confirm source of VOCs is no longer present within the excavation footprint

SAP WORKSHEET #18-2 – SAMPLING LOCATIONS, METHODS, AND SOP REQUIREMENTS TABLE FOR EXCAVATION SOIL SAMPLING *(continued)*

Sampling Location ID Number	Sample ID Number	Matrix	Depth (feet bgs)[1]	Analytical Group	Number of Samples	Sampling SOP Reference	Rationale for Sampling Location
SS-1A-10	SS-1A-10 (10.0)	Soil	10	VOCs[1]	1	ERRG FS-016	Sample is located in the bottom of the excavation; confirm source of VOCs is no longer present within the excavation footprint

Notes:

1. VOCs by EPA Method 8260B (EPA, 2008a)

SAP WORKSHEET #18.3 – SAMPLING LOCATIONS, METHODS, AND SOP REQUIREMENTS TABLE FOR POST-EXCAVATION CONFIRMATION SOIL GAS SAMPLING

Sampling Location ID Number	Sample ID Number	Matrix	Depth(s) (feet bgs)[1]	Analytical Group	Number of Samples	Sampling SOP Reference	Rationale for Sampling Location
CSG-1A-1	CGS-1A-01 (3.5) CGS-1A-02 (6.5)	Soil Gas	3 to 3.5 6 to 6.5	VOCs[1]	2	ERRG FS-050	Confirm VOC concentrations in soil gas do not exceed RBSLs immediately north of the excavation footprint (Round 1)
CSG-1A-2	CGS-1A-03 (3.5) CGS-1A-04 (6.5)	Soil Gas	3 to 3.5 6 to 6.5		2	ERRG FS-050	Confirm source of VOCs is no longer present where VOC contamination was previously detected at PS-1A-1 and evaluate potential for VOCs to migrate into clean backfill (Round 1)
CSG-1A-3	CGS-1A-05 (3.5) CGS-1A-06 (9.5)	Soil Gas	3 to 3.5 9 to 9.5		2	ERRG FS-050	Confirm VOC concentrations in soil gas no longer exceed RBSLs east of the excavation footprint, where VOC contamination was previously detected at PS-1A-2 (Round 1)
CSG-1A-4	CGS-1A-07 (3.5) CGS-1A-08 (6.5)	Soil Gas	3 to 3.5 6 to 6.5		2	ERRG FS-050	Confirm VOC concentrations in soil gas do not exceed RBSLs south of the excavation footprint (Round 1)
CSG-1A-5	CGS-1A-09 (3.5) CGS-1A-10 (6.5)	Soil Gas	3 to 3.5 6 to 6.5		2	ERRG FS-050	Confirm VOC concentrations in soil gas no longer exceed RBSLs west of the excavation footprint along the property boundary, where VOC contamination was previously detected at PS-1A-7 (Round 1)
CSG-1A-6	CGS-1A-11 (3.5) CGS-1A-12 (6.5)	Soil Gas	3 to 3.5 6 to 6.5		2	ERRG FS-050	Confirm VOC concentrations in soil gas do not exceed RBSLs downgradient of the excavation footprint and north of Building 965 (Round 1)
CSG-1A-7	CGS-1A-13 (3.5) CGS-1A-14 (6.5)	Soil Gas	3 to 3.5 6 to 6.5		2	ERRG FS-050	Confirm VOC concentrations in soil gas do not exceed RBSLs downgradient of the excavation footprint and east of Building 965 (Round 1)
CSG-1A-8	CGS-1A-15 (4.0) CGS-1A-16 (7.5)	Soil Gas	3.5 to 4 7 to 7.5		2	ERRG FS-050	Confirm VOC concentrations in soil gas no longer exceed RBSLs, where VOC contamination was previously detected at PS-1A-5 (Round 1)
CSG-1A-9	CGS-1A-17 (3.5) CGS-1A-18 (6.5)	Soil Gas	3 to 3.5 6 to 6.5		2	ERRG FS-050	Confirm VOC concentrations in soil gas do not exceed RBSLs downgradient of the excavation footprint along the eastern site boundary (Round 1)
CSG-1A-10	CGS-1A-19 (4.0) CGS-1A-20 (6.5)	Soil Gas	3.5 to 4 6 to 6.5		2	ERRG FS-050	Confirm VOC concentrations in soil gas no longer exceed RBSLs, where VOC contamination was previously detected at PS-1A-3 (Round 1)

SAP WORKSHEET #18.3 – SAMPLING LOCATIONS, METHODS, AND SOP REQUIREMENTS TABLE FOR POST-EXCAVATION CONFIRMATION SOIL GAS SAMPLING *(continued)*

Sampling Location ID Number	Sample ID Number	Matrix	Depth(s) (feet bgs)[1]	Analytical Group	Number of Samples	Sampling SOP Reference	Rationale for Sampling Location
CSG-1A-11	CGS-1A-21 (3.5) CGS-1A-22 (6.5)	Soil Gas	3 to 3.5 6 to 6.5	VOCs[1]	2	ERRG FS-050	Confirm VOC concentrations in soil gas do not exceed RBSLs east of the excavation footprint, along the site boundary (Round 1)
CSG-1A-12	CGS-1A-23 (3.5) CGS-1A-24 (6.5)	Soil Gas	3 to 3.5 6 to 6.5		2	ERRG FS-050	Confirm VOC concentrations in soil gas do not exceed RBSLs immediately north of the excavation footprint (Round 2)
CSG-1A-13	CGS-1A-25 (3.5) CGS-1A-26 (6.5)	Soil Gas	3 to 3.5 6 to 6.5		2	ERRG FS-050	Confirm source of VOCs is no longer present where VOC contamination was previously detected at PS-1A-1 and evaluate potential for VOCs to migrate into clean backfill (Round 2)
CSG-1A-14	CGS-1A-27 (3.5) CGS-1A-28 (9.5)	Soil Gas	3 to 3.5 9 to 9.5		2	ERRG FS-050	Confirm VOC concentrations in soil gas no longer exceed RBSLs east of the excavation footprint, where VOC contamination was previously detected at PS-1A-2 (Round 2)
CSG-1A-15	CGS-1A-29 (3.5) CGS-1A-30 (6.5)	Soil Gas	3 to 3.5 6 to 6.5		2	ERRG FS-050	Confirm VOC concentrations in soil gas do not exceed RBSLs south of the excavation footprint (Round 2)
CSG-1A-16	CGS-1A-31 (3.5) CGS-1A-32 (6.5)	Soil Gas	3 to 3.5 6 to 6.5		2	ERRG FS-050	Confirm VOC concentrations in soil gas no longer exceed RBSLs west of the excavation footprint along the property boundary, where VOC contamination was previously detected at PS-1A-7 (Round 2)
CSG-1A-17	CGS-1A-33 (3.5) CGS-1A-34 (6.5)	Soil Gas	3 to 3.5 6 to 6.5		2	ERRG FS-050	Confirm VOC concentrations in soil gas do not exceed RBSLs downgradient of the excavation footprint and north of Building 965 (Round 2)
CSG-1A-18	CGS-1A-35 (3.5) CGS-1A-36 (6.5)	Soil Gas	3 to 3.5 6 to 6.5		2	ERRG FS-050	Confirm VOC concentrations in soil gas do not exceed RBSLs downgradient of the excavation footprint and east of Building 965 (Round 2)
CSG-1A-19	CGS-1A-37 (4.0) CGS-1A-38 (7.5)	Soil Gas	3.5 to 4 7 to 7.5		2	ERRG FS-050	Confirm VOC concentrations in soil gas no longer exceed RBSLs, where VOC contamination was previously detected at PS-1A-5 (Round 2)
CSG-1A-20	CGS-1A-39 (3.5) CGS-1A-40 (6.5)	Soil Gas	3 to 3.5 6 to 6.5		2	ERRG FS-050	Confirm VOC concentrations in soil gas do not exceed RBSLs downgradient of the excavation footprint along the eastern site boundary (Round 2)

SAP WORKSHEET #18.3 – SAMPLING LOCATIONS, METHODS, AND SOP REQUIREMENTS TABLE FOR POST-EXCAVATION CONFIRMATION SOIL GAS SAMPLING *(continued)*

Sampling Location ID Number	Sample ID Number	Matrix	Depth(s) (feet bgs)[1]	Analytical Group	Number of Samples	Sampling SOP Reference	Rationale for Sampling Location
CSG-1A-21	CGS-1A-41 (4.0) CGS-1A-42 (6.5)	Soil Gas	3.5 to 4 6 to 6.5	VOCs[1]	2	ERRG FS-050	Confirm VOC concentrations in soil gas no longer exceed RBSLs, where VOC contamination was previously detected at PS-1A-3 (Round 2)
CSG-1A-22	CGS-1A-43 (3.5) CGS-1A-44 (6.5)	Soil Gas	3 to 3.5 6 to 6.5		2	ERRG FS-050	Confirm VOC concentrations in soil gas do not exceed RBSLs east of the excavation footprint, along the site boundary (Round 2)

Notes:

1. VOCs by EPA Method TO-15 (EPA, 1999)

SAP WORKSHEET #18.4 – SAMPLING LOCATIONS, METHODS, AND SOP REQUIREMENTS TABLE FOR BACKFILL SAMPLING

Sample ID Number	Matrix	Depth	Analytical Group	Number of Samples	Rationale for Sampling Location
BS-DS-01	Soil	0 to 0.5	VOCs, SVOCs, TPH (gasoline and diesel ranges), PCBs, metals	1	Characterize import fill to confirm it meets import criteria
BS-DS-02	Soil	0 to 0.5	VOCs, SVOCs, TPH (gasoline and diesel ranges), PCBs, metals	1	Characterize import fill to confirm it meets import criteria
BS-DS-03	Soil	0 to 0.5	VOCs, SVOCs, TPH (gasoline and diesel ranges), PCBs, metals	1	Characterize import fill to confirm it meets import criteria
BS-DS-04	Soil	0 to 0.5	VOCs, SVOCs, TPH (gasoline and diesel ranges), PCBs, metals	1	Characterize import fill to confirm it meets import criteria

SAP WORKSHEET #19 – ANALYTICAL METHODS AND SOP REQUIREMENTS TABLE

Matrix	Analytical Group	Analytical Method/SOP Reference	Containers (number, size, and type)	Sample Volume	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)
Soil	VOCs	EPA Method 8260B[1]	3 × EnCore® Samplers	15 grams	Cool, 4 ± 2 °C	Analyze, preserve, or extract within 48 hours If preserved, analyze within 14 days
Soil Gas	VOCs	EPA Method TO-15[2]	Summa canister	1 liter	None	Analyze most VOCs within 30 days Analyze less stable VOCs within 14 days
Backfill	VOCs and Gasoline-Range Organics	EPA Method 5035/8260B[3] WS-MS-0007	3 × EnCore® Samplers or equivalent	5 grams	Cool to 4 ± 2 °C	48 hours for unpreserved 14 days for preserved (can be frozen upon receipt for 7 days)
Backfill	SVOCs	EPA Method 3550B/8270C[3] WS-OP-0001 WS-MS-0005	1 × 8-ounce glass jar with Teflon®-lined lid or stainless steel liner	30 grams	Cool to 4 ± 2 °C	14 days for extraction and 40 days for analysis
	SVOCs (Benz(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Dibenz(a,h)anthracene, and Indeno(1,2,3-cd)pyrene)	EPA Method 3550B/8270C SIM[3] WS-OP-0001 WS-MS-0008				

SAP WORKSHEET 19 – ANALYTICAL METHODS AND SOP REQUIREMENTS TABLE *(continued)*

Matrix	Analytical Group	Analytical Method/SOP Reference	Containers (number, size, and type)	Sample Volume	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)
Backfill	PCBs	EPA Method 3550B/8082[3] WS-OP-0002 WS-GC-0002	1 × 8-ounce glass jar with Teflon®-lined lid or stainless steel liner	30 grams	Cool to 4 ± 2 °C	14 days for extraction and 40 days for analysis
Backfill	Diesel-Range Organics	EPA Method 3350B/8015B[3] WS-OP-0004 WS-GC-0007	1 × 8-ounce glass jar with Teflon®-lined lid or stainless steel liner	30 grams	Cool to 4 ± 2 °C	14 days for extraction and 40 days for analysis
Backfill	Inductively Coupled Plasma (ICP) Metals	EPA Method 3050A/6010B[3] WS-IP-0002 WS-MT-0003	1 × 8-ounce glass jar with Teflon®-lined lid or stainless steel liner	30 grams	Cool to 4 ± 2 °C	28 days
Backfill	Mercury	EPA Method 7471A[4] WS-MT-007	1 × 8-ounce glass jar with Teflon®-lined lid or stainless steel liner	30 grams	Cool to 4 ± 2 °C	28 days

Notes:

1. EPA, 2008a
2. EPA, 1999
3. EPA, 1996
4. EPA, 1994

SAP WORKSHEET #20 – FIELD QC SAMPLE SUMMARY TABLE

Matrix	Analytical Group	No. of Sampling Locations	No. of Field Duplicates	No. of MS/MSDs	No. of Field Blanks	No. of Equipment Blanks	No. of VOC Trip Blanks	No. of Performance Test Samples	Total No. of Samples to Laboratory
Soil Gas	VOCs	15	1	1	1	0	1	0	19
Soil	VOCs	10	0	1	1	1	1	0	14

SAP WORKSHEET #21 – PROJECT SAMPLING SOP REFERENCES TABLE

Reference Number	Title, Revision Date, and/or Number	Originating Organization of Sampling SOP	Equipment Type	Modified for Project Work? (Y/N)	Comments
ERRG-FS-001	SOP for Field Logbook, 4/14/2007	ERRG	NA	N	Sets criteria for content entry and logbook format
ERRG-FS-002	SOP for Field Logsheet, 4/14/2007	ERRG	NA	N	Identifies minimum information that should be collected during a sampling effort
ERRG-FS-003	SOP for Chain-of-Custody Documentation, 4/14/2007	ERRG	NA	N	Provides requirements for completing COC documentation
ERRG-FS-004	SOP for Custody Seals, 4/14/2007	ERRG	NA	N	Provides requirements for completion and attachment of custody seals
ERRG-FS-005	SOP for Sample Labeling, 4/14/2007	ERRG	NA	N	Provides requirements for completion and attachment of sample labels
ERRG-FS-008	SOP for Packaging and Shipping of Nonhazardous Samples, 4/14/2007	ERRG	NA	N	Provides general instructions for packaging and shipping of nonhazardous samples
ERRG-FS-050	SOP for Soil Vapor Sampling Using Summa Canisters	ERRG	Summa canister	N	Provides methods and procedures for soil gas sampling
ERRG-FS-051	SOP for Soil Sampling Using an Excavator Bucket and Brass or Stainless Steel Sleeve	ERRG	Brass or stainless steel sleeve	N	Provides methods and procedures for soil sampling at depth
ERRG-FS-016	SOP for Sampling VOCs in Soil Using an EnCore® Sampler, 4/14/2007	ERRG	EnCore® sampler	N	Provides methods and procedures for surface soil sampling using a EnCore® Sampler
ERRG-FS-010	SOP for Decontamination of Contact Sampling Equipment, 4/14/2007	ERRG	NA	N	Provides standard for decontaminating contact equipment
ERRG-FS-011	SOP for Data Usability Review, 4/14/2007	ERRG	NA	N	Establishes means of reviewing data for usability and completeness

Note: See Attachment A for complete SOPs.

SAP WORKSHEET #22 – FIELD EQUIPMENT CALIBRATION MAINTENANCE, TESTING, AND INSPECTION TABLE

Field Equipment	Calibration Activity	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	CA	Responsible Person	SOP Reference
PID for organic vapors[a]	Check against standard	▪ Store in protective case when not in use ▪ Check power supplies and connections prior to use ▪ Avoid contact with water	None	Instrument is clean of dust, dirt, and grease	Daily	± 5% of standard value	If equipment does not meet acceptance criteria, remove from service and contact the vendor for repair	Field Team Leader	Not applicable[b]

Notes:

a. A PID will be used for health and safety monitoring. Additional health and safety monitoring using draeger tubes for specific VOCs (particularly benzene and vinyl chloride) will be conducted during field activities to ensure worker health and safety. Calibration and maintenance information for this monitoring is included in the Site Safety and Health Plan for this project (ERRG, 2009).

b. Because various manufacturers are used for on-site field equipment, the manufacturers' instructions will be used as a SOP for calibration and operation of equipment.

PID = photoionization detector

SAP WORKSHEET #23 – ANALYTICAL SOP REFERENCES TABLE

Title, Revision Date, and/or Number	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work?
Air Toxics Ltd. Methods Manual Revision 16.1, 10/2007, Page 30, 8.0 TO-14A/TO-15 – VOCs (SOP for the Determination of VOCs by EPA Method TO-14A/TO-15, 10/2007, Rev 16.1)	Definitive	VOCs	Gas Chromatograph/Mass Spectrometer (GC/MS)	AirToxics Ltd.	No
TestAmerica SOP WS-MS-0007 (SOP for the Determination of VOCs by EPA Methods 624/8260B, 11/2006, Rev 5.0)	Definitive	VOCs	GC/MS	TestAmerica	No
TestAmerica SOP WS-MS-0007 (Determination of VOCs and Total Purgeable Petroleum Hydrocarbons by GC/MS, Revision 4, 12/03/2008)	Definitive	VOCs and Gasoline-Range Organics	GC/MS	TestAmerica	No
TestAmerica SOP WS-MS-0005 (GC/MS Analysis Based on Method 8270C, Revision 4.1, 6/19/2009)	Definitive	SVOCs	GC/MS	TestAmerica	No
TestAmerica SOP WS-MW-0008 (Determination of Polycyclic Aromatic Hydrocarbons by GC/MS-SIM Internal Standard Technique, Revision 2, 2/29/2008)	Definitive	SVOCs (Benz(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Dibenz(a,h)anthracene, and Indeno(1,2,3-cd)pyrene)	GC/MS	TestAmerica	No
TestAmerica SOP WS-GC-0002 (Chromatographic Analysis Based on SW-846 Methods 8000B and 8082, and Compendium Methods TO-4, TO-4A, TO-10, and TO-10A, Revision 4.1, 6/24/2009)	Definitive	PCBs	Gas Chromatograph/Electron Capture Detector (GC/ECD)	TestAmerica	No
TestAmerica SOP WS-GC-0007 (Gas Chromatographic Analysis of Total Petroleum Hydrocarbons, Revision 5.1, 1/16/2009)	Definitive	Diesel-Range Organics	Gas Chromatograph/ Flame Ionization Detector (GC-FID)	TestAmerica	No

SAP WORKSHEET #23 – ANALYTICAL SOP REFERENCES TABLE *(continued)*

Title, Revision Date, and/or Number	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work?
TestAmerica SOP WS-MT-0003 (Inductively Coupled Plasma-Atomic Emission Spectroscopy, Spectrometric Method for Trace Element Analyses, SW-846 Method 6010/B/6010C and EPA Method 200.7, Revision 5, 12/1/2008)	Definitive	Metals	ICP	TestAmerica	No
TestAmerica SOP WS-MT-0007 (Preparation and Analysis of Mercury in Solid Samples by Cold Vapor Atomic Absorption, Revision 4, 1/8/2007)	Definitive	Mercury	Cold Vapor Atomic Absorption (CVAA)	TestAmerica	No

SAP WORKSHEET #24 – ANALYTICAL INSTRUMENT CALIBRATION TABLE

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	CA	Person Responsible for CA	SOP Reference
GC/MS	Check of mass spectral ion intensities (tuning procedure) using BFB (8260B)	Prior to ICAL and at the beginning of each 12-hour period.	Refer to method/SOP for specific ion criteria.	Retune instrument and verify.	Lab Manager/ Analyst	WS-MS-0007
	Check of mass spectral ion intensities (tuning procedure) using DFTPP (8270C)					WS-MS-0005
	Minimum five-point initial calibration for target analytes, lowest concentration standard at or near the reporting limit. (ICAL)	Initial calibration prior to sample analysis	1) <u>Average Response factor (RF) for SPCCs:</u> VOCs ≥ 0.30 for chlorobenzene and 1,1,2,2-PCA, ≥ 0.10 for chloromethane, bromoform, and 1,1-dichloroethane, 2) <u>RSD for RFs for CCCs</u>: ≤30% and one option below: a) RSD for each analyte ≤15%, b) linear least squares regression r ≥ 0.995; c) non-linear regression COD r-sq ≥ 0.99, min 6 points for second order.	Correct problem, then repeat initial calibration		WS-MS-0007
			1) <u>Average Response factor (RF) for SPCCs:</u> ≥ 0.050, 2) <u>RSD for RFs for CCCs</u>: ≤30% and one option below: a) RSD for each analyte ≤15%, b) linear least squares regression r ≥ 0.995; c) non-linear regression COD r-sq ≥ 0.99, min 6 points for second order.			WS-MS-0005

SAP WORKSHEET #24 – ANALYTICAL INSTRUMENT CALIBRATION TABLE *(continued)*

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	CA	Person Responsible for CA	SOP Reference
GC/MS	Second-source calibration verification	Once after each ICAL	All project analytes within ±20% of true value.	Correct problem, and verify second source standard. Rerun verification. If still fails, repeat initial calibration.	Lab Manager/ Analyst	WS-MS-0007 WS-MS-0005
	Retention Time Window Position Establishment	Once per ICAL, for each analyte and surrogate.	Set position using the mid-point standard of the ICAL when ICAL is performed. On days when ICAL is not performed, use initial CCV.	NA	Analyst	
	Daily calibration verification	Daily, prior to sample analysis and every 12 hours of analysis time. Gasoline: At the beginning and end of 12 hour sequence.	1. Min RRF for SPCCs: RRF ≥ 0.30 for chlorobenzene and 1,1,2,2-PCA, ≥ 0.10 for chloromethane, bromoform, and 1,1-dichloroethane. 2. %Difference/%Drift for all target compounds and surrogates: %D ≤ 20% Gasoline: The percent drift/difference for RF ≤ 20%. The percent drift/difference for RF is less than or equal to 20%.	Correct problem, then repeat. If still fails, repeat initial calibration. Reanalyze all samples since last successful calibration verification.	Lab Manager/ Analyst	WS-MS-0007
			1. Min RRF for SPCCs: ≥0.050, 2. %Difference/%Drift for all target compounds and surrogates: %D ≤ 20%			WS-MS-0005
	Internal Standards	During acquisition of calibration standard.	Areas within -50% to +100% of last ICAL mid-point for each CCV	Inspect mass spectrometer and GC for malfunctions; mandatory reanalysis of samples analyzed while system was malfunctioning	Lab Manager/ Analyst	WS-MS-0007 WS-MS-0005
GC/MS (for SIM)	Check of mass tuning	Prior to ICAL and at the beginning of each 12-hour period.	Values for masses 69, 219, and 264 (if using PFTBA) within ± 0.50 amu of the target mass.	Retune instrument and verify.	Lab Manager/ Analyst	WS-MS-0008

SAP WORKSHEET #24 – ANALYTICAL INSTRUMENT CALIBRATION TABLE *(continued)*

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	CA	Person Responsible for CA	SOP Reference
GC/MS (for SIM)	Minimum five-point initial calibration for target analytes, lowest concentration standard at or near the reporting limit. (ICAL)	Initial calibration prior to sample analysis	a) RSD for each analyte ≤ 15%; or b) linear least squares regression r ≥ 0.995; or c) non-linear regression COD r-sq ≥ 0.99, min 6 points for second order.	Correct problem, then repeat initial calibration	Lab Manager/ Analyst	WS-MS-0008
	Second-source calibration verification	Once after each ICAL	All project analytes within ± 20% of true value.	Correct problem, and verify second source standard. Rerun verification. If still fails, repeat initial calibration.		
	Retention Time Window Position Establishment	Once per ICAL, for each analyte and surrogate.	Set position using the mid-point standard of the ICAL when ICAL is performed. On days when ICAL is not performed, use initial CCV.	Not applicable	Analyst	
	Daily calibration verification	Daily, prior to sample analysis and every 12 hours of analysis time.	%Difference/%Drift for all target compounds and surrogates: %D ≤ 20%	Correct problem, then repeat. If still fails, repeat initial calibration. Reanalyze all samples since last successful calibration verification.	Lab Manager/ Analyst	
	Internal Standards	During acquisition of calibration standard.	Areas within -50% to +100% of last ICAL mid-point for each CCV	Inspect mass spectrometer and GC for malfunctions; mandatory reanalysis of samples analyzed while system was malfunctioning		

SAP WORKSHEET #24 – ANALYTICAL INSTRUMENT CALIBRATION TABLE *(continued)*

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	CA	Person Responsible for CA	SOP Reference
GC/ECD GC/FID	Minimum five-point initial calibration for target analytes, lowest concentration standard at or near the reporting limit	Initial calibration prior to sample analysis	One of the options below: 1): RSD for each analyte ≤ 20%; 2) Linear least squares regression: r ≥ 0.995; 3) non-linear regression: COD (r^2) ≥ 0.99, minimum of 6 points for second order.	Correct problem, then repeat initial calibration	Lab Manager/ Analyst	WS-GC-0002
	Retention Time Window Position Establishment	Once per ICAL, for each analyte and surrogate.	Set position using the mid-point standard of the ICAL when ICAL is performed. On days when ICAL is not performed, use initial CCV.	NA	Analyst	
	Second-source calibration verification	Immediately following ICAL.	All project analytes within ± 20% of the expected value from the ICAL.	Correct problem, then repeat. If still fails, repeat initial calibration.	Lab Manager/ Analyst	
	Daily calibration verification	Prior to sample analysis, after every 10 field samples, and at the end of the sequence.	All project analytes within ± 20% of the expected value from the ICAL.	Correct problem, then repeat. If still fails, repeat initial calibration. Re-analyze all samples since the last successful calibration verification.		
ICP	Initial calibration (IC) per manufacturer's instructions, with a minimum of one standard and a calibration blank	Initial calibration prior to sample analysis	Correlation coefficient >0.995 (if more than one point); accepted if the initial calibration verification (ICV) passes	Correct problem, then repeat initial calibration.	Lab Manager/ Analyst	WS-MT-0003

SAP WORKSHEET #24 – ANALYTICAL INSTRUMENT CALIBRATION TABLE *(continued)*

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	CA	Person Responsible for CA	SOP Reference
ICP	Low concentration standard at or near the reporting limit	Daily, after one point calibration	Within ±20% of the true value for all target analytes	Correct problem, then repeat. If still fails, repeat initial calibration	Lab Manager/ Analyst	WS-MT-0003
	Second-source ICV, prepared at the calibration midpoint	Once per initial calibration	Within ±10% of the true value for all target analytes.			
	Continuing calibration verification (CCV), same source as IC	Following IC, after every 10 samples and the end of the sequence		Correct problem, then repeat. If still fails, repeat initial calibration. Re-analyze all samples since the last successful calibration verification.		
CVAA	Initial calibration (IC) per manufacturer's instructions, with a minimum of five standards and a calibration blank	Initial calibration prior to sample analysis	Correlation coefficient >0.995; accepted if the initial calibration verification (ICV) passes	Correct problem, then repeat initial calibration.	Lab Manager/ Analyst	WS-MT-0005 WS-MT-0007
	Second-source ICV, prepared at the calibration midpoint	Once per initial calibration	Less than 10% difference from IC for all target analytes	Correct problem, then repeat. If still fails, repeat initial calibration		
	Continuing calibration verification (CCV), same source as IC	Following IC, after every 10 samples and the end of the sequence	Less than 20% difference from IC for all target analytes	Correct problem, then repeat. If still fails, repeat initial calibration. Re-analyze all samples since the last successful calibration verification.		

SAP WORKSHEET #24 – ANALYTICAL INSTRUMENT CALIBRATION TABLE *(continued)*

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	CA	Person Responsible for CA	SOP Reference
GC/MS	Minimum 5-point	Upon instrument receipt, instrument alteration (new trap, column, etc.), or when CCV exceeds ± 20%	% RSD ≤ 30 with two compounds allowed out to ≤ 40% RSD for quad and 5&20 (four allowed out for low level).	Correct problem then repeat initial calibration curve.	Laboratory Analyst	Air Toxics Ltd. Methods Manual Revision 16.1, 10/2007 Page 30 8.0 TO-14A/TO-15 – VOCs
GC/MS	Analyze a midpoint calibration verification standard	At the start of each day and, if required by a specific project, every 12 hours	70-130%. Chemicals exceeding this criterion and associated data will be flagged and narrated except for high bias associated with nondetects. If more than two chemicals from the standard list recover outside of 70-130%, CA will be taken. Unless prior client approval, under no circumstances will samples be analyzed if any chemical exceeds 60-140%. For low-level analysis, the above applies except CA will be taken if more than four chemicals from the standard list recover outside of 70-130%.	Perform maintenance and repeat test. If the system still fails the CCV, perform a new 5-point calibration curve.		

SAP WORKSHEET #25 – ANALYTICAL INSTRUMENT AND EQUIPMENT MAINTENANCE, TESTING, AND INSPECTION TABLE

Instrument/ Equipment	Maintenance, Testing, and Inspection Activity	Frequency	Acceptance Criteria	CA	Responsible Person	SOP Reference
GC/MS	Tuning - Clean sources, maintain vacuum pumps	Service vacuum pumps twice per year, other maintenance as needed	Tune and CCV pass criteria	Recalibrate instrument	TestAmerica Chemist	WS-MS-0007 WS-MS-0005 WS-MS-0008
	Sensitivity Check - Change septum, clean injection port, change or clip column, install new liner, change trap	Daily or as needed	Tune and CCV pass criteria	Reinspect injector port, cut additional column, reanalyze CCV, recalibrate instrument		
GC/ECD GC/FID	Detector signals and chromatogram review - Change septum, clean injection port, change or clip column, install new liner	As needed	CCV passes criteria	Reinspect injector port, cut additional column, reanalyze CCV, recalibrate instrument		WS-GC-0002
ICP	Intensity of 1PPM Manganese STD within criteria - Replace disposables, flush lines, clean injector and torch	Daily or as needed	Intensity of 1PPM Manganese STD within criteria	Replace, investigate injector, reanalyze		WS-MT-0003
	Monitor ISTD counts for variation - Replace pump windings	As needed	Monitor ISTD counts for variation	Replace windings, recalibrate and reanalyze		
CVAA	Sensitivity check - Replace disposables, flush lines	Daily or as needed	CCV pass criteria	Recalibrate		WS-MT-0005 WS-MT-0007

SAP WORKSHEET #25 – ANALYTICAL INSTRUMENT AND EQUIPMENT MAINTENANCE, TESTING, AND INSPECTION TABLE *(continued)*

Instrument/ Equipment	Maintenance, Testing, and Inspection Activity	Frequency	Acceptance Criteria	CA	Responsible Person	SOP Reference
GC/MS	Check gas supply	Daily	None	Replace gas cylinder	Laboratory Analyst	Air Toxics Ltd., Methods Manual, Revision 16.1, 10/2007 Page 30, 8.0 TO-14A/TO-15 – VOCs
	Change in-line filter, septa, injection port liners	As needed	None	Replace filters		
	Replace or clip column	As needed	All checks pass	Replace or clip column		
	Clean source	As needed	No visible contamination	Replace source		
	Change pump oil	Annually	None	Replace pump oil		
	Check gas supply	Daily	None	Replace gas cylinder		

SAP WORKSHEET #26 – SAMPLE HANDLING SYSTEM

SAMPLE COLLECTION, PACKAGING, AND SHIPMENT
Sample Collection (Personnel/Organization): Field Team Leader/ERRG
Sample Packaging (Personnel/Organization): Field Team Leader/ERRG
Coordination of Shipment (Personnel/Organization): Field Team Leader/ERRG
Type of Shipment/Carrier: FedEx
SOIL SAMPLE RECEIPT AND ANALYSIS
Sample Receipt (Personnel/Organization): Sample Coordinator/TestAmerica
Sample Custody and Storage (Personnel/Organization): Sample Coordinator/TestAmerica
Sample Preparation (Personnel/Organization): Laboratory Analyst/TestAmerica
Sample Determinative Analysis (Personnel/Organization): Laboratory Analyst/TestAmerica
SOIL GAS SAMPLE RECEIPT AND ANALYSIS
Sample Receipt (Personnel/Organization): Sample Coordinator/Air Toxics Ltd.
Sample Custody and Storage (Personnel/Organization): Sample Coordinator/Air Toxics Ltd.
Sample Preparation (Personnel/Organization): Laboratory Analyst/Air Toxics Ltd.
Sample Determinative Analysis (Personnel/Organization): Laboratory Analyst/Air Toxics Ltd.
SAMPLE ARCHIVING
Field Sample Storage (No. of days from sample collection): Field samples will be archived for 60 days after sample analysis results have been reported
Sample Extract/Digestate Storage (No. of days from extraction/digestion): Sample extracts will be archived for 40 days after extraction
Biological Sample Storage (No. of days from sample collection): Not applicable
SAMPLE DISPOSAL
Personnel/Organization: Sample Coordinator/TestAmerica Laboratory/Air Toxics Ltd.
Number of Days after Analysis: Samples will be held for 60 days after sample analysis results have been reported

SAP WORKSHEET #27 – SAMPLE CUSTODY REQUIREMENTS

SOPs for sample numbering, labeling, packaging, shipping, COC documentation, and custody seals are referenced on Worksheet #21.

27.1. SAMPLE NUMBERING

Soil gas sample numbers will be in the form of "XX-YY-Z(D)," where:

- "XXX" = sampling event identifier (PSG or CSG)
- "YY" = parcel identifier (1A)
- "Z(D)" = sample collection sequence number (depth of sample collection)

The sample identification number will include a sampling event identifier, the parcel identifier, and the sample collection sequence number. For example, identification number PSG-1A-1(4.5) would represent pre-excavation soil gas, Parcel 1A, sequence 1, collected at 4.5 feet bgs.

Soil sample numbers will be in the form of "SS-1A-XX(D)," where:

- "XX" = sampling event identifier (SS)
- "YY" = parcel identifier (1A)
- "XX(D)" = sample collection sequence number (depth of sample collection)

For example, identification number SS-1A-1(4) would represent excavation soil sample, Parcel 1A, sequence 1, collected at 4 feet bgs.

27.2. SAMPLE LABELING

Soil sample labels will be printed on with indelible black ink. Sample labels will be affixed directly to sample containers. Each sample label will contain, at a minimum, the following information:

- Sample identification number (see "Sample Numbering" above)
- Sample collection date (month/day/year)
- Time of collection (24-hour clock)
- Company name
- Project number/name
- Sampler's initials
- Preservation (if any)
- Analyses to be performed (EPA Method Number)

27.3. SAMPLE PACKAGING AND SHIPMENT

An overriding consideration for data resulting from laboratory analyses is the ability to demonstrate that the data are legally defensible, i.e., that the samples were obtained from the locations stated and that they reached the laboratory without alteration. To accomplish this, evidence of collection, shipment, laboratory receipt, and laboratory custody until disposal will be documented through the COC record. A sample is considered to be in custody if the following conditions have been observed:

- In actual possession or in view of the person who collected the samples
- Locked in a secure area
- Placed in an area restricted to authorized personnel
- Placed in a container and secured with an official seal, so that the sample cannot be reached without breaking the seal

27.4. CHAIN OF CUSTODY

The COC record will be the controlling document to ensure that the sample custody is maintained. Upon collecting a sample, sampling personnel will initiate the COC record in the field. Each time the sample custody is transferred, the former custodian will sign the COC on the “Relinquished By” line, and the new custodian will sign the COC on the ”Received By” line. The date, time, and project or company affiliation will accompany each signature. The airbill number and courier name will be recorded on the COC when FedEx is used. The shipping container will be secured with two custody seals, thereby allowing for custody to be maintained by the shipping personnel until receipt by the laboratory.

Sample custody will be the responsibility of sampling personnel from the time of sample collection until the samples are accepted by the laboratory via courier or FedEx. Thereafter, the laboratory performing the analysis will maintain custody. The sample custodian will sign the COC from the courier or FedEx, inventory each shipment, and note on the original COC record any discrepancy in the sample custody, temperature of the cooler, or broken sample containers. The laboratory will note discrepancies on the sample receipt form. The laboratory project manager will immediately notify the project chemist. The project chemist, in consultation with the project team, will provide instructions in writing to the laboratory. The laboratory will have a system for tracking samples consistent with Section 5.8 of the Quality Systems Manual (U.S. Department of Defense, 2006). The laboratory will archive the samples and maintain their custody up to 90 calendar days after sample collection, at which time the samples will be disposed of by the laboratory.

In addition to providing a custody exchange record for the samples, the COC record serves as a formal request for sample analyses. The COC records will be completed, signed, and distributed as follows:

- White and pink copies sent to the analytical laboratory with the sample shipment
- Yellow copy retained on site for inclusion in the project files

- A copy faxed or e-mailed to the project chemist on a daily basis to allow tracking of samples during shipment and confirm laboratory receipt of samples
- Manila copy sent to the project chemist

Samples will be uniquely designated using the numbering system described above in Subsection 27.2.

The sample number will be recorded in the field logbook, on the labels, and on the COC record at the time of sample collection. A complete description of the sample and sampling conditions will be recorded in the field logbook and referenced using the unique sample identification number.

Sample packaging and shipment procedures for this project will conform to U.S. Department of Transportation and International Air Transport Association procedures, as applicable for packaging. All glass sample containers will first be protected with bubble wrap if transported by overnight courier.

Each cooler will be shipped with a temperature blank. A temperature blank is a vial filled with tap water and stored in the cooler during sample collection and transportation. The temperature of the cooler will be recorded by the laboratory on the COC record immediately upon receipt of the samples. Sample cooler drain spouts will be taped from the inside and outside of the cooler to prevent any leakage.

Samples transported by a laboratory-assigned courier will be packed in a sample cooler with sufficient ice (cooler will be approximately half full of wet ice that is below and above sample containers). Two custody seals will be taped across the cooler lid: one seal in the front and one seal in the back. The COC record will be completed and signed by the courier. The cooler and the top two copies (white and pink) of the COC record will then be released to the courier for transportation to the laboratory.

Samples to be shipped by overnight courier will be packed in a sample cooler lined with a plastic bag. Ice will be double-bagged and placed at the bottom of the cooler, one layer of sample containers will be placed on the ice, and more double-bagged ice will be placed on top of the containers. This process will be repeated until the cooler is filled with ice as the top layer in the cooler. The COC record will include the airbill number, and the "Received By" box will be labeled with overnight courier. The top two copies of the COC record will be sealed in a double-resealable bag and then taped to the inside of the sample cooler lid. The cooler will be taped shut with strapping tape. Two custody seals will be taped across the cooler lid: one seal in the front and one seal in the back. Clear tape will be applied to the custody seals to prevent accidental breakage during shipment. The pouch for the airbill will be placed on the cooler and secured with clear tape. The airbill will be completed for priority overnight delivery and placed in the pouch. If multiple coolers are being shipped, the original airbill will be placed on the cooler with the COC record, and copies of the airbill will be placed on the other coolers. The number of packages should be included on each airbill (1 of 2, 2 of 2). Saturday deliveries should be coordinated with the laboratory in advance, and field sampling personnel or their designee must ensure that Saturday delivery stickers are placed on each cooler by overnight courier.

27.5. LABORATORY SAMPLE CUSTODY PROCEDURES

Once the samples arrive at TestAmerica and Air Toxics Ltd., laboratory personnel will sign the COC record documenting transfer of the samples to the laboratory. The sample custodian will then log pertinent sample information into the Laboratory Information Management System. The overall responsibility for sample safety will lie with the sample custody officer in ensuring that sample custody procedures are followed.

SAP WORKSHEET #28.1 – LABORATORY QC SAMPLES TABLE

Matrix	Soil Gas
Analytical Group	VOCs
Analytical Method/ SOP Reference	TO-15 (EPA 1999)/ Air Toxics Ltd., Methods Manual, Revision 16.1, 10/2007, Page 30, 8.0 TO-14A/TO-15 – VOCs

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per batch of 20 samples	< ½ the reporting limit of each chemical	Identify source of contamination, then reanalyze affected batch samples or qualify data	Laboratory Analyst	Accuracy/Bias	Method Blank < ½ Reporting Limit
Laboratory Blank	1 per batch of 20 samples	< ½ the reporting limit of each chemical	Identify source of contamination, then reanalyze affected batch samples or qualify data	Laboratory Analyst	Accuracy/Bias	Laboratory Blank < ½ Reporting Limit
MS/ MSD	1 per batch of 20 samples	Within control limits listed in Table 28-1	If MS/MSD is outside control limits, reanalyze affected samples or qualify data	Laboratory Analyst	Precision	Within control limits listed in Table 28-1
LCS	1 per batch	Within control limits listed in Table 28-1	If LCS is outside of control limits, reanalyze affected samples or qualify data	Laboratory Analyst	Accuracy/Bias	Within control limits listed in Table 28-1

SAP WORKSHEET #28.2 – LABORATORY QC SAMPLES TABLE

Matrix	Soil
Analytical Group	VOCs
Analytical Method/ SOP Reference	8260B (EPA 2008)/ TestAmerica SOP WS-MS-0007

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per batch of 20 samples	< ½ the reporting limit of each chemical	Identify source of contamination, then reanalyze affected batch samples or qualify data	Laboratory Analyst	Accuracy/Bias	Method Blank < ½ Reporting Limit
Laboratory Blank	1 per batch of 20 samples	< ½ the reporting limit of each chemical	Identify source of contamination, then reanalyze affected batch samples or qualify data	Laboratory Analyst	Accuracy/Bias	Laboratory Blank < ½ Reporting Limit
MS/ MSD	1 per batch of 20 samples	Within control limits listed in Table 28-2	If MS/MSD is outside control limits, reanalyze affected samples or qualify data	Laboratory Analyst	Precision	Within control limits listed in Table 28-2
LCS	1 per batch	Within control limits listed in Table 28-2	If LCS is outside of control limits, reanalyze affected samples or qualify data	Laboratory Analyst	Accuracy/Bias	Within control limits listed in Table 28-2

SAP WORKSHEET #28.3 – LABORATORY QC SAMPLES TABLE

Matrix	Backfill
Analytical Group	VOCs and Gasoline-Range Organics
Analytical Method/ SOP Reference	8260B (EPA 2008)/ TestAmerica SOP WS-MS-0007

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	Data Quality Indicator	Measurement Performance Criteria
Check of mass spectral ion intensities (tuning procedure) using BFB (8260B)	Prior to initial calibration and calibration verification	Must meet the method requirements before samples are analyzed in accordance with DoD QSM requirements	Retune instrument and verify the tune acceptability in accordance with DoD QSM requirements	Lab Manager / Analyst	Sensitivity	Meets all EPA Method requirements
Internal standards	During acquisition of calibration standard, samples, and QC check samples	Areas within -50% to +100% of midpoint of the last ICAL for each sample and QC in accordance with DoD QSM requirements	Inspect mass spectrometer and GC for malfunctions; mandatory reanalysis of samples analyzed while system was malfunctioning in accordance with DoD QSM requirements	Lab Manager / Analyst	Precisions and Accuracy/Bias	Meets all EPA Method requirements

SAP WORKSHEET #28.3 - LABORATORY QC SAMPLES TABLE *(continued)*

Matrix	Backfill
Analytical Group	VOCs and Gasoline-Range Organics
Analytical Method/ SOP Reference	8260B (EPA 2008)/ TestAmerica SOP WS-MS-0007

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	Data Quality Indicator	Measurement Performance Criteria
Method blank	One per analytical batch (8260B)	No target analytes ≥ ½ RL and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). For common laboratory contaminants, no analytes detected >RL in accordance with DoD QSM requirements	Correct problem. If required, then re-extract and reanalyze method blank and all samples processed with the contaminated blank in accordance with DoD QSM requirements	Lab Manager / Analyst	Accuracy/Bias Contamination	No target analytes ≥ RL
MS/MSD	One MS/MSD per analytical/preparation batch	QSM or laboratory statistically derived control limits	Identify problem; if not related to matrix interference, re-extract and reanalyze MS/MSD and all associated batch samples in accordance with DoD QSM requirements	Lab Manager / Analyst	Precision and Accuracy/Bias	QSM or laboratory statistically derived control limits

SAP WORKSHEET #28.3 - LABORATORY QC SAMPLES TABLE *(continued)*

Matrix	Backfill
Analytical Group	VOCs and Gasoline-Range Organics
Analytical Method/ SOP Reference	8260B (EPA 2008)/ TestAmerica SOP WS-MS-0007

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	Data Quality Indicator	Measurement Performance Criteria
LCS	One LCS per analytical/preparation batch	QSM or laboratory statistically derived control limits in accordance with DoD QSM requirements	Correct problem, then re-extract and reanalyze the LCS and all associated batch samples in accordance with DoD QSM requirements	Lab Manager / Analyst	Precision and Accuracy/Bias	QSM or laboratory statistically derived control limits
Surrogate standards	All field and QC samples.	In accordance with DoD QSM criteria and requirements	Correct problem, then re-extract and reanalyze all affected samples in accordance with DoD QSM requirements	Lab Manager / Analyst	Accuracy/Bias	QSM or laboratory statistically derived control limits

SAP WORKSHEET #28.4 – LABORATORY QC SAMPLES TABLE

Matrix	Backfill
Analytical Group	SVOCs
Analytical Method/ SOP Reference	8270C (EPA 2008)/ TestAmerica SOP WS-MS-0005

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	Data Quality Indicator	Measurement Performance Criteria
Check of mass spectral ion intensities (tuning procedure) using DFTPP (8270C)	Prior to initial calibration and calibration verification	Must meet the method requirements before samples are analyzed in accordance with DoD QSM requirements	Retune instrument and verify the tune acceptability in accordance with DoD QSM requirements	Lab Manager / Analyst	Sensitivity	Meets all EPA Method requirements
Internal standards	During acquisition of calibration standard, samples, and QC check samples	Areas within -50% to +100% of midpoint of the last ICAL for each sample and QC in accordance with DoD QSM requirements	Inspect mass spectrometer and GC for malfunctions; mandatory reanalysis of samples analyzed while system was malfunctioning in accordance with DoD QSM requirements	Lab Manager / Analyst	Precisions and Accuracy/Bias	Meets all EPA Method requirements

SAP WORKSHEET #28.4 - LABORATORY QC SAMPLES TABLE *(continued)*

Matrix	Backfill
Analytical Group	SVOCs
Analytical Method/ SOP Reference	8270C (EPA 2008)/ TestAmerica SOP WS-MS-0005

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	Data Quality Indicator	Measurement Performance Criteria
Method blank	One per analytical batch (8270C)	No target analytes ≥ ½ RL and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). For common laboratory contaminants, no analytes detected >RL in accordance with DoD QSM requirements	Correct problem. If required, then re-extract and reanalyze method blank and all samples processed with the contaminated blank in accordance with DoD QSM requirements	Lab Manager / Analyst	Accuracy/Bias Contamination	No target analytes ≥ RL
MS/MSD	One MS/MSD per analytical/preparation batch	QSM or laboratory statistically derived control limits	Identify problem; if not related to matrix interference, re-extract and reanalyze MS/MSD and all associated batch samples in accordance with DoD QSM requirements	Lab Manager / Analyst	Precision and Accuracy/Bias	QSM or laboratory statistically derived control limits
LCS	One LCS per analytical/preparation batch	QSM or laboratory statistically derived control limits in accordance with DoD QSM requirements	Correct problem, then re-extract and reanalyze the LCS and all associated batch samples in accordance with DoD QSM requirements	Lab Manager / Analyst	Precision and Accuracy/Bias	QSM or laboratory statistically derived control limits

SAP WORKSHEET #28.4 - LABORATORY QC SAMPLES TABLE *(continued)*

Matrix	Backfill
Analytical Group	SVOCs
Analytical Method/ SOP Reference	8270C (EPA 2008)/ TestAmerica SOP WS-MS-0005

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	Data Quality Indicator	Measurement Performance Criteria
Surrogate standards	All field and QC samples.	In accordance with DoD QSM criteria and requirements	Correct problem, then re-extract and reanalyze all affected samples in accordance with DoD QSM requirements	Lab Manager / Analyst	Accuracy/Bias	QSM or laboratory statistically derived control limits

SAP WORKSHEET #28.5 – LABORATORY QC SAMPLES TABLE

Matrix	Backfill
Analytical Group	SVOCs
Analytical Method/ SOP Reference	8270C SIM (EPA 2008)/ TestAmerica SOP WS-MS-0008

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	Data Quality Indicator	Measurement Performance Criteria
Internal standards	During acquisition of calibration standard, samples, and QC check samples	Areas within -50% to +100% of midpoint of the last ICAL for each sample and QC in accordance with DoD QSM requirements	Inspect mass spectrometer and GC for malfunctions; mandatory reanalysis of samples analyzed while system was malfunctioning in accordance with DoD QSM requirements	Lab Manager / Analyst	Precisions and Accuracy/Bias	Meets all EPA Method requirements
Method blank	One per analytical batch (8260B)	No target analytes ≥ ½ RL and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). For common laboratory contaminants, no analytes detected >RL in accordance with DoD QSM requirements	Correct problem. If required, then re-extract and reanalyze method blank and all samples processed with the contaminated blank in accordance with DoD QSM requirements	Lab Manager / Analyst	Accuracy/Bias Contamination	No target analytes ≥ RL

SAP WORKSHEET #28.5 - LABORATORY QC SAMPLES TABLE *(continued)*

Matrix	Backfill
Analytical Group	SVOCs
Analytical Method/ SOP Reference	8270C SIM (EPA 2008)/ TestAmerica SOP WS-MS-0008

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	Data Quality Indicator	Measurement Performance Criteria
MS/MSD	One MS/MSD per analytical/preparation batch	QSM or laboratory statistically derived control limits	Identify problem; if not related to matrix interference, re-extract and reanalyze MS/MSD and all associated batch samples in accordance with DoD QSM requirements	Lab Manager / Analyst	Precision and Accuracy/Bias	QSM or laboratory statistically derived control limits
LCS	One LCS per analytical/preparation batch	QSM or laboratory statistically derived control limits in accordance with DoD QSM requirements	Correct problem, then re-extract and reanalyze the LCS and all associated batch samples in accordance with DoD QSM requirements	Lab Manager / Analyst	Precision and Accuracy/Bias	QSM or laboratory statistically derived control limits
Surrogate standards	All field and QC samples	In accordance with DoD QSM criteria and requirements	Correct problem, then re-extract and reanalyze all affected samples in accordance with DoD QSM requirements	Lab Manager / Analyst	Accuracy/Bias	QSM or laboratory statistically derived control limits

SAP WORKSHEET #28.6 – LABORATORY QC SAMPLES TABLE

Matrix	Backfill
Analytical Group	PCBs
Analytical Method/ SOP Reference	8082 (EPA 2008)/ TestAmerica SOP WS-GC-0002

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	Data Quality Indicator	Measurement Performance Criteria
Method Blank	One per preparation batch	No target analytes ≥ ½ RL and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). For common laboratory contaminants, no analytes detected >RL in accordance with DoD QSM requirements.	Correct problem, then reprepare and reanalyze the method blank and all samples processed with the contaminated blank in accordance with DoD QSM requirements	Lab Manager/Analyst	Accuracy/Bias Contamination	No target analytes ≥ ½ RL in accordance with DoD QSM requirements
LCS	One LCS per preparation batch	QC acceptance criteria as specified by DoD; or laboratory statistically derived control limits in accordance with DoD QSM requirements	Correct problem, the reprepare and reanalyze the LCS and all samples in the associated preparation batch for failed analytes, if sufficient sample material is available.	Lab Manager/Analyst	Precision and Accuracy/Bias	QC acceptance criteria: as specified by DoD; or laboratory statistically derived control limits

SAP WORKSHEET #28.6 - LABORATORY QC SAMPLES TABLE *(continued)*

Matrix	Backfill
Analytical Group	PCBs
Analytical Method/ SOP Reference	8082 (EPA 2008)/ TestAmerica SOP WS-GC-0002

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	Data Quality Indicator	Measurement Performance Criteria
MS/MSD for all analytes	One MS/MSD pair per preparation batch	QC acceptance criteria as specified by DoD; or laboratory statistically derived control limits in accordance with DoD QSM requirements	Examine the project-specific DQOs. Evaluate the data, and reprepare and reanalyze the native sample and MS/MSD pair as indicated.	Lab Manager/Analyst	Precision and Accuracy/Bias	QC acceptance criteria: as specified by DoD; or laboratory statistically derived control limits

SAP WORKSHEET #28.7 – LABORATORY QC SAMPLES TABLE

Matrix	Backfill
Analytical Group	Diesel-Range Organics
Analytical Method/ SOP Reference	8015B (EPA 2008)/ TestAmerica SOP WS-GC-0007

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	Data Quality Indicator	Measurement Performance Criteria
Method Blank	One per preparation batch	No target analytes ≥ ½ RL and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). For common laboratory contaminants, no analytes detected >RL in accordance with DoD QSM requirements.	Correct problem, then reprepare and reanalyze the method blank and all samples processed with the contaminated blank in accordance with DoD QSM requirements	Lab Manager/Analyst	Accuracy/Bias Contamination	No target analytes ≥ ½ RL in accordance with DoD QSM requirements
LCS	One LCS per preparation batch	QC acceptance criteria as specified by DoD; or laboratory statistically derived control limits in accordance with DoD QSM requirements	Correct problem, the reprepare and reanalyze the LCS and all samples in the associated preparation batch for failed analytes, if sufficient sample material is available.	Lab Manager/Analyst	Precision and Accuracy/Bias	QC acceptance criteria: as specified by DoD; or laboratory statistically derived control limits

SAP WORKSHEET #28.7 - LABORATORY QC SAMPLES TABLE *(continued)*

Matrix	Backfill
Analytical Group	Diesel-Range Organics
Analytical Method/ SOP Reference	8015B (EPA 2008)/ TestAmerica SOP WS-GC-0007

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	Data Quality Indicator	Measurement Performance Criteria
MS/MSD for all analytes	One MS/MSD pair per preparation batch	QC acceptance criteria as specified by DoD; or laboratory statistically derived control limits in accordance with DoD QSM requirements	Examine the project-specific DQOs. Evaluate the data, and reprepare and reanalyze the native sample and MS/MSD pair as indicated.	Lab Manager/Analyst	Precision and Accuracy/Bias	QC acceptance criteria: as specified by DoD; or laboratory statistically derived control limits

SAP WORKSHEET #28.8 – LABORATORY QC SAMPLES TABLE

Matrix	Backfill
Analytical Group	Metals
Analytical Method/ SOP Reference	6010B (EPA 2008)/ TestAmerica SOP WS-MT-0003

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	Data Quality Indicator	Measurement Performance Criteria
Calibration blank	After IC, after CCV calibration, after every 10 samples, and at the end of the sequence	No target analytes detected > LOD in accordance with DoD QSM requirements.	Correct problem. Reprepare and reanalyze the blank. All samples following the last acceptable calibration blank must be reanalyzed.	Lab Manager / Analyst	Accuracy	No target analytes > LOD in accordance with DoD QSM requirements
Method blank	One per digestion batch	No target analytes ≥ ½ RL and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). For common laboratory contaminants, no analytes detected >RL in accordance with DoD QSM requirements.	Correct problem, then reprepare and reanalyze the method blank and all samples processed with the contaminated blank in accordance with DoD QSM requirements.	Lab Manager / Analyst	Accuracy/Bias Contamination	No target analytes ≥ ½ RL in accordance with DoD QSM requirements

SAP WORKSHEET #28.8 - LABORATORY QC SAMPLES TABLE *(continued)*

Matrix	Backfill
Analytical Group	Metals
Analytical Method/ SOP Reference	6010B (EPA 2008)/ TestAmerica SOP WS-MT-0003

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	Data Quality Indicator	Measurement Performance Criteria
Interference check solution (ICS)	At the beginning of an analytical run	ICSA-A: Absolute values of concentration for all non-spiked analytes < LOD (unless they are a verified trace impurity from one of the spiked analytes); ICS-AB: Within ±20% of true value in accordance with DoD QSM requirements	Terminate analysis, correct problem, then reanalyze ICS and all affected samples in accordance with DoD QSM requirements	Lab Manager / Analyst	Accuracy	Within ±20% of expected value in accordance with DoD QSM requirements
LCS	One LCS per each preparation batch	QC acceptance criteria as specified by DoD; or laboratory statistically derived control limits in accordance with DoD QSM requirements	Correct problem, the reprepare and reanalyze the LCS and all samples in the associated preparation batch for failed analytes, if sufficient sample material is available.	Lab Manager / Analyst	Precision and Accuracy/Bias	QC acceptance criteria: as specified by DoD; or laboratory statistically derived control limits

SAP WORKSHEET #28.8 - LABORATORY QC SAMPLES TABLE *(continued)*

Matrix	Backfill
Analytical Group	Metals
Analytical Method/ SOP Reference	6010B (EPA 2008)/ TestAmerica SOP WS-MT-0003

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	Data Quality Indicator	Measurement Performance Criteria
MS/MSD for all analytes	One MS/MSD pair per preparation batch	QC acceptance criteria as specified by DoD; or laboratory statistically derived control limits in accordance with DoD QSM requirements	Examine the project-specific DQOs. Evaluate the data, and reprepare and reanalyze the native sample and MS/MSD pair as indicated.	Lab Manager / Analyst	Precision and Accuracy/Bias	QC acceptance criteria: as specified by DoD (RPD ≤ 20); or laboratory statistically derived control limits
Dilution Test	Each new sample matrix	1:5 dilution must agree within ±10% of the original determination in accordance with DoD QSM requirements	Perform post-digestion spike addition in accordance with DoD QSM requirements	Lab Manager / Analyst	Accuracy	10% Difference
Post digestion spike addition	When dilution test fails or analyte concentration in all samples < 50 x LOD.	Recovery within 75% to 125% of expected results in accordance with DoD QSM requirements	Flag accordance with DoD QSM requirements	Lab Manager / Analyst	Accuracy	Recovery within 75% to 125% of expected results in accordance with DoD QSM requirements

SAP WORKSHEET #28.9 – LABORATORY QC SAMPLES TABLE

Matrix	Backfill
Analytical Group	Mercury
Analytical Method/ SOP Reference	87470A/7471A (EPA 2008)/ TestAmerica SOP WS-MT-005 / WS-MT-0007

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	Data Quality Indicator	Measurement Performance Criteria
Calibration blank	After IC, after CCV calibration, after every 10 samples, and at the end of the sequence	No target analytes detected > LOD in accordance with DoD QSM requirements.	Correct problem. Reprepare and reanalyze the blank. All samples following the last acceptable calibration blank must be reanalyzed.	Lab Manager / Analyst	Accuracy	No target analytes > LOD in accordance with DoD QSM requirements
Method blank	One per digestion batch	No target analytes ≥ ½ RL and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). For common laboratory contaminants, no analytes detected >RL in accordance with DoD QSM requirements.	Correct problem, then reprepare and reanalyze the method blank and all samples processed with the contaminated blank in accordance with DoD QSM requirements.	Lab Manager / Analyst	Accuracy/Bias Contamination	No target analytes ≥ ½ RL in accordance with DoD QSM requirements

SAP WORKSHEET #28.9 - LABORATORY QC SAMPLES TABLE *(continued)*

Matrix	Backfill
Analytical Group	Mercury
Analytical Method/ SOP Reference	87470A/7471A (EPA 2008)/ TestAmerica SOP WS-MT-005 / WS-MT-0007

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	Data Quality Indicator	Measurement Performance Criteria
MS/MSD	One MS/MSD pair per preparation batch	QC acceptance criteria as specified by DoD (80% to 120% accuracy, 20% precision); or laboratory statistically derived control limits in accordance with DoD QSM requirements	QC acceptance criteria as specified by DoD (80% to 120% accuracy, 20% precision); or laboratory statistically derived control limits in accordance with DoD QSM requirements	Lab Manager / Analyst	Precisions and Accuracy/Bias	QC acceptance criteria: 80% to 120% accuracy, 20% precision or laboratory statistically derived control limits
LCS	One LCS per each preparation batch	QC acceptance criteria as specified by DoD (80% to 120% accuracy, 20% precision); or laboratory statistically derived control limits in accordance with DoD QSM requirements	Terminate analysis, identify and correct the problem, then re-prepare and reanalyze all affected samples and QC checks in accordance with DoD QSM requirements	Lab Manager / Analyst	Precision and Accuracy/Bias	QC acceptance criteria: 80% to 120% accuracy, 20% precision or laboratory statistically derived control limits

Table 28-1. Precision and Accuracy for Soil Gas Samples

Analyte	Precision (%RPD)	Accuracy MS/MSD (% recovery)	Accuracy LCS/LCSD (% recovery)
VOCs			
Benzene	25	N/A	70 - 130
1,3-Butadiene	25	N/A	60 - 140
cis-1,2-DCE	25	N/A	70 - 130
Ethylbenzene	25	N/A	70 - 130
TCE	25	N/A	70 - 130
Vinyl chloride	25	N/A	70 - 130

Table 28-2. Precision and Accuracy for Soil Samples

Analyte	Precision (%RPD)	Accuracy MS/MSD (% recovery)	Accuracy LCS/LCSD (% recovery)
VOCs			
Benzene	30	75-125	75-125
1,3-Butadiene	10-84	10-84	10-84
cis-1,2-DCE	30	65-125	65-125
Ethylbenzene	30	75-125	75-125
TCE	30	75-125	75-125
Vinyl chloride	30	60-125	60-125

Note:
LCSD = laboratory control spike duplicate

Table 28-3. Recovery and Precision Limits for Backfill Samples[1]

Analyte	Precision (RPD)	Recovery Limits (LCS/MS/MSD)
VOCs		
1,1,1,2-Tetrachloroethane	30	75 - 125
1,1,1-Trichloroethane	30	70 - 135
1,1,2,2-Tetrachloroethane	30	55 - 130
1,1,2-Trichloroethane	30	60 - 125
1,1-Dichloroethane	30	75 - 125
1,1-Dichloroethene	30	65 - 135
1,1-Dichloropropene	30	70 - 135
1,2,3-Trichlorobenzene	30	60 - 135
1,2,3-Trichloropropane	30	65 - 130
1,2,4-Trichlorobenzene	30	65 - 130
1,2,4-Trimethylbenzene	30	65 - 135
1,2-Dibromo-3-chloropropane (DBCP)	30	40 - 135
1,2-Dibromoethane (EDB)	30	70 - 125
1,2-Dichlorobenzene	30	75 - 120
1,2-Dichloroethane	30	70 - 135
1,2-Dichloropropane	30	70 - 120
1,3,5-Trimethylbenzene	30	65 - 135
1,3-Dichlorobenzene	30	70 - 125
1,3-Dichloropropane	30	75 - 125
1,4-Dichlorobenzene	30	70 - 125
2,2-Dichloropropane	30	65 - 135
2-Butanone (MEK)	30	30 - 160
2-Chlorotoluene	30	70 - 130
2-Hexanone	30	45 - 145
4-Chlorotoluene	30	75 - 125
4-Methyl-2-pentanone (MIBK)	30	45 - 145
Acetone	30	20 - 160
Benzene	30	75 - 125
Bromobenzene	30	65 - 120
Bromochloromethane	30	70 - 125
Bromodichloromethane	30	70 - 130
Bromoform	30	55 - 135
Bromomethane	30	30 - 160
Carbon disulfide	30	45 - 160
Carbon tetrachloride	30	65 - 135
Chlorobenzene	30	75 - 125
Chloroethane	30	40 - 155
Chloroform	30	70 - 125

Table 28-3. Recovery and Precision Limits for Backfill Samples[1] *(continued)*

Analyte	Precision (RPD)	Recovery Limits (LCS/MS/MSD)
VOCs *(continued)*		
Chloromethane	30	50 - 130
cis-1,2-Dichloroethene	30	65 - 125
cis-1,3-Dichloropropene	30	70 - 125
Dibromochloromethane	30	65 - 130
Dibromomethane	30	75 - 130
Dichlorodifluoromethane (Freon 12)	30	35 - 135
Ethylbenzene	30	75 - 125
Hexachlorobutadiene	30	55 - 140
Isopropylbenzene	30	75 - 130
Methyl tert-butyl ether (MTBE)	30	66 - 146
Methylene chloride	30	55 - 140
m-Xylene & p-Xylene	30	80 - 125
Naphthalene	30	40 - 125
n-Butylbenzene	30	65 - 140
n-Propylbenzene	30	65 - 135
o-Xylene	30	75 - 125
p-Isopropyltoluene	30	75 - 135
sec-Butylbenzene	30	65 - 130
Styrene	30	75 - 125
tert-Butylbenzene	30	65 - 130
Tetrachloroethene	30	65 - 140
Toluene	30	70 - 125
trans-1,2-Dichloroethene	30	65 - 135
trans-1,3-Dichloropropene	30	65 - 125
Trichloroethene	30	75 - 125
Trichlorofluoromethane (Freon 11)	30	25 - 185
Vinyl chloride	30	60 - 125
SVOCs		
1,2,4-Trichlorobenzene	30	45 - 110
1,2-Dichlorobenzene	30	45 - 95
1,3-Dichlorobenzene	30	40 - 100
1,4-Dichlorobenzene	30	35 - 105
2,4,5-Trichlorophenol	30	50 - 110
2,4,6-Trichlorophenol	30	45 - 110
2,4-Dichlorophenol	30	45 - 110
2,4-Dimethylphenol	30	30 - 105
2,4-Dinitrophenol	30	15 - 130
2,4-Dinitrotoluene	30	50 - 115

Table 28-3. Recovery and Precision Limits for Backfill Samples[1] *(continued)*

Analyte	Precision (RPD)	Recovery Limits (LCS/MS/MSD)
SVOCs *(continued)*		
2,6-Dinitrotoluene	30	50 - 110
2-Chloronaphthalene	30	45 - 105
2-Chlorophenol	30	45 - 105
2-Methylnaphthalene	30	45 - 105
2-Methylphenol	30	40 - 105
2-Nitroaniline	30	45 - 120
2-Nitrophenol	30	40 - 110
3,3'-Dichlorobenzidine	30	10 - 130
3-Methylphenol & 4-Methylphenol	30	40 - 105
3-Nitroaniline	30	25 - 110
4,6-Dinitro-2-methylphenol	30	30 - 135
4-Bromophenyl phenyl ether	30	45 - 115
4-Chloro-3-methylphenol	30	45 - 115
4-Chloroaniline	30	10 - 95
4-Chlorophenyl phenyl ether	30	45 - 110
4-Nitroaniline	30	35 - 115
4-Nitrophenol	30	15 - 140
Acenaphthene	30	45 - 110
Acenaphthylene	30	45 - 105
Anthracene	30	55 - 105
Benz(a)anthracene	30	50 - 110
Benzo(a)pyrene	30	50 - 110
Benzo(b)fluoranthene	30	45 - 115
Benzo(g,h,i)perylene	30	40 - 125
Benzo(k)fluoranthene	30	45 - 125
Benzoic acid	30	0 - 110
Benzyl alcohol	30	20 - 125
bis(2-Chloroethoxy)methane	30	45 - 110
bis(2-Chloroethyl) ether	30	40 - 105
bis(2-Chloroisopropyl) ether	30	20 - 115
bis(2-Ethylhexyl) phthalate	30	45 - 125
Butyl benzyl phthalate	30	50 - 125
Carbazole	30	45 - 115
Chrysene	30	55 - 110
Dibenz(a,h)anthracene	30	40 - 125
Dibenzofuran	30	50 - 105
Diethylphthalate	30	50 - 115
Dimethylphthalate	30	50 - 110

Table 28-3. Recovery and Precision Limits for Backfill Samples[1] *(continued)*

Analyte	Precision (RPD)	Recovery Limits (LCS/MS/MSD)
SVOCs *(continued)*		
Di-n-butylphthalate	30	55 - 110
Di-n-octylphthalate	30	40 - 130
Fluoranthene	30	55 - 115
Fluorene	30	50 - 110
Hexachlorobenzene	30	45 - 120
Hexachlorobutadiene	30	40 - 115
Hexachloroethane	30	35 - 110
Indeno(1,2,3-cd)pyrene	30	40 - 120
Isophorone	30	45 - 110
Naphthalene	30	40 - 105
Nitrobenzene	30	40 - 115
N-Nitrosodiphenylamine	30	50 - 115
Pentachlorophenol	30	25 - 120
Phenanthrene	30	50 - 110
Phenol	30	40 - 100
Pyrene	30	45 - 125
PCBs		
Aroclor-1016	30	40 - 140
Aroclor-1026	30	60 - 130
Diesel-Range Organics		
Diesel-Range Organics	NA	NA
Metals		
Aluminum	20	80 - 120
Antimony	20	80 - 120
Arsenic	20	80 - 120
Barium	20	80 - 120
Beryllium	20	80 - 120
Cadmium	20	80 - 120
Calcium	20	80 - 120
Chromium	20	80 - 120
Cobalt	20	80 - 120
Copper	20	80 - 120
Iron	20	80 - 120
Lead	20	80 - 120
Magnesium	20	80 - 120
Manganese	20	80 - 120

Table 28-3. Recovery and Precision Limits for Backfill Samples[1] *(continued)*

Analyte	Precision (RPD)	Recovery Limits (LCS/MS/MSD)
Metals *(continued)*		
Mercury	20	80 - 120
Molybdenum	20	80 - 120
Nickel	20	80 - 120
Potassium	20	80 - 120
Selenium	20	80 - 120
Silver	20	80 - 120
Sodium	20	80 - 120
Thallium	20	80 - 120
Vanadium	20	80 - 120
Zinc	20	80 - 120

Notes:

1. Recovery and precision limits are from the U.S. Department of Defense (DoD) Quality Systems Manual (QSM). If no limit is available in the QSM, the laboratory historical control limits are used (as per the QSM). Laboratory historical control limits are subject to change as a result of periodic reevaluation. Limits in use at the time of sample analysis are available from the laboratory.

SAP WORKSHEET #29 – PROJECT DOCUMENTS AND RECORDS TABLE

Document	Where Maintained
Sampling and Analysis Plan	ERRG Project File and DON Administrative Record
Work Plan	
Accident Prevention Plan/Site Safety and Health Plan	
After Action Summary Report	
Field Data Collection Sheets	
Analytical Data Packages	
Data Validation Reports	
Field COC Records	ERRG Project File and Laboratory
Field Logbook, Air Bills, Communication Logs, CA Reports, Documentation of Deviation From Field Methods	ERRG Project File
Laboratory QA Plan	Laboratory
Method Detection Limit Study Information	
National Environmental Laboratory Accreditation Program (NELAP)	
Sample Receipt and Tracking Records	
Laboratory COC Records	
Equipment Calibration Logs	
Sample Preparation Logs	
CA Forms and Reports and Documentation of CA Results	
Electronic Copy of Analytical Data Reports	ERRG Project File and Laboratory
Data Summary and Instrument Raw Data for Field Samples, Standards, QC Checks, and QC Samples	Laboratory
Laboratory Internal Data Package Completeness Checklist	
Case Narrative, Definition of Laboratory Qualifiers, Documentation of Laboratory Method Deviations, Laboratory Sample Identification Numbers, Signatures for Laboratory Sign-Off	ERRG Project File and Laboratory
Standards Traceability Records, Analytical Audit Checklists	Laboratory
Electronic Data Deliverables	ERRG Project File and Laboratory
Field Sampling Audit Checklists, Data Assessment Reports, Assessment CA Reports	ERRG Project File

SAP WORKSHEET #30 – ANALYTICAL SERVICES TABLE

Matrix	Analytical Group	Sample Location/ID Numbers	Analytical Method/SOP Reference	Data Package Turnaround Time	Laboratory (Name and Address, Contact Person and Telephone Number)	Backup Laboratory (Name and Address, Contact Person and Telephone Number)
Soil Gas	VOCs	All samples indicated in Worksheet #18	EPA Method TO-15/ EPA, 1999	15 business days	Air Toxics Ltd. 180-B Blue Ravine Rd Folsom, CA 95630 Contact: Kyle Vagadori Phone: 916-985-1000	TestAmerica Laboratories, Inc. 880 Riverside Pkwy West Sacramento, CA 95605 Contact: Michael Flournoy Phone: 916-373-5600
Soil	VOCs	Excavation confirmation samples as indicated in Worksheet #18	EPA Method 8260B/ EPA, 2008a	15 business days	TestAmerica Laboratories, Inc. 880 Riverside Pkwy West Sacramento, CA 95605 Contact: Michael Flournoy Phone: 916-373-5600	Curtis and Tompkins, Ltd. 2323 Fifth Street Berkeley, CA 94710 Contact: Mike Pearl Phone: 510-486-0900

Note: Air Toxics Ltd. and TestAmerica are certified by NELAP and the State of California and approved by DON.

SAP WORKSHEET #31 – PLANNED PROJECT ASSESSMENTS TABLE

Assessment Type	Frequency	Internal or External	Organization Performing Assessment	Person(s) Responsible for Performing Assessment (Title and Org.)	Person(s) Responsible for Responding to Assessment Findings (Title and Org.)	Person(s) Responsible for Identifying and Implementing CA (Title and Org.)	Person(s) Responsible for Monitoring Effectiveness of CA (Title and Org.)
Internal Laboratory Assessment	Once per sample batch	Internal	TestAmerica	QA/QC Manager, TestAmerica	Laboratory Manager, TestAmerica	Laboratory Manager, TestAmerica	QA/QC Manager, TestAmerica
Internal Laboratory Assessment	Once per sample batch	Internal	Air Toxics Ltd	QA/QC Manager, Air Toxics Ltd	Laboratory Manager, Air Toxics Ltd	Laboratory Manager, Air Toxics Ltd	QA/QC Manager, Air Toxics Ltd
Field Sampling Audit	Once at start of sampling	Internal	ERRG	Field Team Leader, ERRG	Project Manager, ERRG	Project Manager, ERRG	Field Team Leader, ERRG
Data Validation	Once per sample batch	External	LDC	Data Validator, LDC	Project Manager, ERRG	Project Manager, ERRG	QCM, ERRG
Laboratory Assessment	As determined by the DON	External	Naval Facilities Engineering Service Center (NFESC)	NFESC Representative	Laboratory Director	Laboratory Director	NFESC Representative

SAP WORKSHEET #32 – ASSESSMENT FINDING AND CORRECTIVE ACTION RESPONSES TABLE

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings (Name, Title, Org.)	Timeframe of Notification	Nature of CA Response Documentation	Individual(s) Receiving CA Response (Name, Title, Org.)	Timeframe for Response
Internal Laboratory Assessment	Laboratory report to detail project deviations	Michael Flournoy, TestAmerica Kyle Vagadori, Air Toxics Ltd	Within 5 days of sample analysis	Documented in the laboratory report	Lisa Stafford, QA/QC Manager, TestAmerica Melanie Levesque, QA/QC Manager, Air Toxics Ltd	2 weeks
Field Sampling Audit	Checklist to detail deviations from SAP	Caitlin Gorman, Project Manager, ERRG	Once at start of sampling	E-mail and phone log; ERRG field audit form	Anthony Broderick, Field Team Leader, ERRG	3 days
Data Validation	Data validation report to detail deviations from SAP and project requirements	Caitlin Gorman, Project Manager, ERRG	3 weeks after data submittal	E-mail and phone log	Michael Schwennesen, QCM, ERRG	1 week

SAP WORKSHEET #33 – QA MANAGEMENT REPORTS TABLE

Type of Report	Frequency (daily, weekly monthly, quarterly, annually, etc.)	Projected Delivery Date(s)	Person(s) Responsible for Report Preparation (Title and Organizational Affiliation)	Report Recipient(s) (Title and Organizational Affiliation)
Field Sampling Audit	Once at start of sampling	10-26-2009	Field Team Leader, ERRG	Caitlin Gorman, Project Manager, ERRG
Draft After Action Summary Report	Once after all QA management and data usability completed	1-22-2009	Project Manager, ERRG	David Clark, DON RPM
Final After Action Summary Report	Once after regulatory agency comments are addressed	2-22-2010	Project Manager, ERRG	David Clark, DON RPM

SAP WORKSHEET #34 – VERIFICATION (STEP I) PROCESS TABLE

Verification Input	Description	Internal/ External	Responsible for Verification (Name, Org.)
Chain of Custody	COC records will be reviewed internally upon their completion and verified against the packed samples. When the record has been verified, the reviewer will initial by the shipper's signature. A copy of the record will be retained in the project files, and the original will be placed with the packed sample containers for shipment.	Internal	Anthony Broderick, ERRG
Field Logbook	Field notes will be reviewed internally and placed in the project file.	Internal	Anthony Broderick, ERRG
Field Sampling Audit	At least one audit of the field activities will be conducted to assess compliance of activities with the SAP and to support data quality. The assessor will review sample collection, identification, handling, and shipping procedures; and equipment calibration, maintenance, and field data recording procedures.	Internal	Michael Schwennesen, ERRG
Analytical Data Packages	All data will be subjected to a tiered review process before they are released from the laboratory. The **first step** is when the analysts review the quality of their work based on established guidelines. The review includes reviewing and performing the following activities: (1) ensure that calibrations, tunes, blanks, and any other instrument QC criteria were met during the analysis reported; (2) ensure that calculations of individual chemicals and detection limits were met; (3) verify that holding times or extraction times were met; and (4) make notes or footnotes on the report if abnormalities occurred during analysis or if any other QA/QC problems associated with the sample occurred. The **second step** is performed by a supervisor or data review specialist whose function is to provide an independent review of data packages. This person will verify that all dates, sample identification, detection limits, reported chemical concentrations, concentration units, header information, and footnotes or comments were transcribed accurately. This person will also check to ensure that data that do not meet project objectives will be flagged with the appropriate data qualifiers. All information in the final report that can be verified against the COC record will be checked for errors and completeness. The **third step** is done by the Laboratory Director or his or her designee who will sign the final reports. This person spot-checks activities associated with log-in, tracking, extraction, sample analysis, and final reporting for technical and scientific soundness. The Laboratory QA Manager then will review 10% of all data packages to ensure that all QA requirements have been met. This person will ensure that the data package is consistent and complies with project requirements.	Internal	Michael Flournoy, TestAmerica Kyle Vagadori, Air Toxics Ltd.
EDDs	All EDDs will be verified internally by the laboratory performing the work for completeness and technical accuracy prior to submittal. All received EDDs will be verified externally against hardcopy laboratory data packages.	Internal/ External	Michael Flournoy, TestAmerica Kyle Vagadori, Air Toxics Ltd. Erlinda Rauto, LDC

SAP WORKSHEET #34 – VERIFICATION (STEP I) PROCESS TABLE *(continued)*

Verification Input	Description	Internal/ External	Responsible for Verification (Name, Org.)
Final Project SAP	The final project SAP will be reviewed internally and submitted to the approval entity and lead agency for approval. A copy of the SAP will be maintained on site during field activities. Copies of the document will be maintained in the DON Administrative Record and ERRG project file.	Internal	Caitlin Gorman, Project Manager, ERRG

SAP WORKSHEET #35 – VALIDATION (STEPS IIA AND IIB) PROCESS TABLE

Steps IIa/IIb	Validation input	Description	Responsible for Validation (name, org.)
IIa	Chemicals	Ensure that the required chemicals were reported as specified in methods, procedures, or contracts.	Michael Flournoy, TestAmerica Kyle Vagadori, Air Toxics Ltd. Erlinda Rauto, LDC
IIa	Chain of Custody	Examine traceability of the data from time of collection through reporting. Examine COC records against methods, procedures, or contracts.	Michael Flournoy, TestAmerica Kyle Vagadori, Air Toxics Ltd. Erlinda Rauto, LDC
IIa	Sampling Methods and Procedures	Ensure that sampling methods were followed and any deviations were documented.	Anthony Broderick, ERRG
IIa	Sample Handling	Ensure that sample handling, receipt, and storage procedures were followed and any deviations were documented.	Anthony Broderick, ERRG Erlinda Rauto, LDC
IIa	Analytical Methods and Procedures	Ensure that the required analytical methods were used and any deviations were noted.	Michael Flournoy, TestAmerica Kyle Vagadori, Air Toxics Ltd. Erlinda Rauto, LDC
IIa	Data Qualifiers	Determine that laboratory data qualifiers were defined and applied as specified in methods, procedures, or contracts.	Michael Flournoy, TestAmerica Kyle Vagadori, Air Toxics Ltd. Erlinda Rauto, LDC
IIa	Standards	Determine that standards were traceable and met the method requirements.	Michael Flournoy, TestAmerica Kyle Vagadori, Air Toxics Ltd. Erlinda Rauto, LDC
IIa	Step IIA Validation Report	Summarize deviations from methods, procedures, or contracts. Include qualified data and explanation of all data qualifiers.	Michael Flournoy, TestAmerica Kyle Vagadori, Air Toxics Ltd. Erlinda Rauto, LDC
IIb	Sampling Plan	Determine whether the SAP was executed as specified (e.g., the number, location, and type of field samples were collected and analyzed as specified in the SAP).	Michael Schwennesen, ERRG
IIb	Sampling Procedures	Evaluate whether sampling procedures were followed with respect to equipment and sample handling (e.g., techniques, equipment, temperature, preservatives, etc.).	Anthony Broderick, ERRG
IIb	Holding Times	Ensure that samples were analyzed within holding times specified in methods, procedures, or contracts and any deviations were documented.	Michael Schwennesen, ERRG Erlinda Rauto, LDC
IIb	Field Duplicates	Compare results of field duplicates with criteria in the SAP and document any deviations.	Michael Schwennesen, ERRG
IIb	Project Quantitation Limits	Determine that quantitation limits were achieved as outlined in the SAP.	Michael Schwennesen, ERRG

SAP WORKSHEET #35 – VALIDATION (STEPS IIA AND IIB) PROCESS TABLE *(continued)*

Steps IIa/IIb	Validation input	Description	Responsible for Validation (name, org.)
IIb	Performance Criteria	Evaluate QC data against project-specific performance criteria (e.g., precisions, accuracy, representativeness, comparability, completeness, and sensitivity).	Michael Schwennesen, ERRG
IIb	Step IIb Validation Report	Summarize outcome of comparison of the data with method performance criteria in the SAP.	Michael Schwennesen, ERRG

SAP WORKSHEET #36 – ANALYTICAL DATA VALIDATION (STEPS IIA AND IIB) SUMMARY TABLE

Step IIa/IIb	Matrix	Analytical Group	Validation Criteria	Data Validator (title and organizational affiliation)
IIa	Soil	VOCs (EPA Method 8260B)	SW-846 Test Methods, EPA Contract Laboratory Program; DoD QSM for Environmental Laboratories[1]; DON Environmental Work Instruction 1, 3EN2.1, Chemical Data Validation[2]	Data Validator, LDC
IIb	Soil	Same as above	SAP Worksheets #10, #11, #12, #15, #18, and #20; DoD QSM for Environmental Laboratories[1]; DON Environmental Work Instruction 1, 3EN2.1, Chemical Data Validation[2]	Data Validator, LDC QCM, ERRG
IIa	Soil Gas	VOCs (EPA Method TO-15)	EPA Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air; DoD QSM for Environmental Laboratories[1]; DON Environmental Work Instruction 1, 3EN2.1, Chemical Data Validation[2]	Data Validator, LDC
IIb	Soil Gas	Same as above	SAP Worksheets #10, #11, #12, #15, #18, and #20; DoD QSM for Environmental Laboratories[1]; DON Environmental Work Instruction 1, 3EN2.1, Chemical Data Validation[2]	Data Validator, LDC QCM, ERRG

The following documents will be used as guidance for validating all data: "USEPA Contract Laboratory Program, National Functional Guidelines for Superfund Organic Methods Data Review, USEPA-540-R-08-001" (EPA, 2008b); "Environmental Work Instruction 3EN2.1, Chemical Data Validation" (DON, 2001); "Test Methods for Evaluating Solid Waste, Physical Chemical Methods, SW-846," Third Edition and final updates (EPA, 2008a); and the QC criteria specified in this SAP.

Data validation will be performed by an independent data validation company. For this project, 90 percent of the data will require EPA Level III-equivalent data validation and 10 percent EPA Level IV-equivalent data validation. Data may be qualified as protocol or advisory. Protocol violations are when the laboratory deviates from the referenced analytical methods or the project-specific QLs, QC limits, or QC criteria. Advisory violations are when technical validation criteria have not been met.

[1] U.S. Department of Defense, 2009. "Department of Defense Quality Systems Manual for Environmental Laboratories, Version 4.1." April 22. Available Online at: <http://www.navylabs.navy.mil/>.

[2] U.S. Department of the Navy, 2001. "Environmental Work Instruction 3EN2.1, Chemical Data Validation." November 28.

SAP WORKSHEET #37 – USABILITY ASSESSMENT

The data quality assessment will be performed by project decision-makers. All data will be assessed based on project DQOs. Key project personnel, including the Project Manager and QCM, will evaluate the overall quality of the data set to determine whether the sampling design performed as expected and whether the project decisions can be made with the desired level of certainty, e.g.:

- Do chemicals of concern in soil gas exceed the RBSLs at the site?
- Do temporal and spatial trends indicate that soil gas concentrations are decreasing at the site?
- Is further response and CA appropriate or is a NFA determination appropriate for the site?

This evaluation involves reviewing the analytical results and QA management reports while considering the specific questions outlined in Worksheet #10. Evaluation of the laboratory QC samples will permit an estimation of analytical uncertainty.

The data quality assessment team will perform the following steps, using guidance contained in “Data Quality Assessment: A Reviewer’s Guide, EPA QA/G-9R” (EPA, 2006a) and “Data Quality Assessment: Statistical Methods for Practitioners, EPA QA/G-9S” (EPA, 2006b).

1. Review the project objectives and sampling design defined during systematic planning to ensure they are still applicable and that assumptions were valid.
2. Review QA reports and conduct preliminary review of the data set.
3. Reconvene the project team to discuss the quality of the data and if the data set meets the project needs.

In looking at the overall measurement error associated with this project, the data will be reviewed for precision, accuracy, representativeness, comparability, and completeness (PARCC) parameters. If project-required measurement performance criteria are not achieved for these parameters, then it will need to be determined whether the project data are usable to address the environmental questions asked in Worksheet #10. If the project data are not usable then it will need to be determined if resampling is necessary.

37.1. PRECISION

Precision quantifies the repeatability of a given measurement. Precision is estimated by calculating the RPD of laboratory duplicates, as shown in the following equation:

$$RPD = 100 \times 2 \times (\text{result - duplicate result})/(\text{result + duplicate result})$$

The RPD limits for laboratory duplicates, MSDs, and LCSDs are presented in Worksheet #28, and the RPD limits for field duplicates are listed in Worksheet #12. Associated samples that do not meet the criteria will be discussed in the data quality assessment by the ERRG QCM.

37.2. ACCURACY

Accuracy refers to the percentage of a known amount of chemical recovered from a given matrix. Percent recoveries are estimated using the following equation.

Percent Recovery = 100 × (spiked sample result **-** *unspiked sample result)/amount of spike added*

The laboratory will review the QC samples to ensure that internal QC data lie within the limits of acceptability. Any suspect trends will be investigated and CAs taken.

37.3. REPRESENTATIVENESS

Representativeness is the degree to which a sample or group of samples is indicative of the population being studied. Over the course of this project, samples will be collected in a manner such that they are representative of both the chemical composition and the physical state of the sample at the time of sampling.

Comparability is the degree to which one data set can be compared with another. To ensure comparability, samples will be collected at specified intervals and in a similar manner and will be analyzed within the required holding times by accepted and comparable methods. All data and units used in reporting for this project will be consistent with accepted conventions for environmental matrix analyses. This approach will ensure direct comparability between the results from this project and the results from other projects using the methods presented in this SAP.

Representativeness and comparability will be accomplished by comparing the COC records and field notes with the data for the sample. If the reported concentration of a field sample from a specific location is an anomaly, then efforts will be made to determine if the sample was compromised during collection, preservation, shipping, or analysis. QA/QC requirements that bracket questionable data will be reviewed to confirm the performance of instrumentation during the time when questionable data were generated. Any deviation will be documented, and CAs will be taken to determine if the data meet project goals. If the data do not meet project goals, then the need for additional sampling and analysis will be determined.

Sensitivity is the capability of a test method or instrument to discriminate between measurement responses representing different levels (e.g., concentrations) of a chemical of interest. Sensitivity has been addressed primarily through the selection of appropriate analytical methods, equipment, and instrumentation. It will be monitored through the achievement of the established method detection limits, instrument calibration, and procedural blanks.

37.6. COMPARABILITY

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another, whether it was generated by a single laboratory or during interlaboratory studies. The use of standardized field and analytical procedures ensures comparability of analytical data.

Sample collection and handling procedures will adhere to EPA-approved protocols. Laboratory procedures will follow standard analytical protocols, use standard units, use standardized report formats, follow the calculations as referenced in approved analytical methods, and use a standard statistical approach for QC measurements. Any deviations from field or analytical procedures will be discussed in the data quality assessment.

37.5. COMPLETENESS

Completeness refers to the percentage of valid data received from actual testing done in the laboratory. Completeness is calculated as shown in the following equation. The target completeness goal for all compounds is 90 percent. The goal by holding times will be 100 percent.

$$\% \text{ completeness} = 100 \times (\text{number of valid chemical results/number of possible results})$$

The laboratory that generates the analytical data has the primary responsibility for the correctness and completeness of the data. Before releasing any analytical data, the laboratory will review and verify that the data have met all of the method criteria and are scientifically correct. Data reviews include the evaluation of information, as presented by an analyst or staff member, for accurate representation of the samples submitted.

The usability of the data will be discussed in the QC summary of the After Action Summary Report.

After review of the PARCC parameters, the ERRG QCM will summarize in the data quality assessment any impact on and limitations of the data usability based on the above review parameters. The data quality assessment will be part of a larger report that discusses the findings of the data and any subsequent recommendations for the project.

REFERENCES

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Attachment A. Sampling Standard Operating Procedures

List of Standard Operating Procedures

- ERRG-FS-001– SOP for Field Logbook, 4/14/2007
- ERRG-FS-002– SOP for Field Logsheet, 4/14/2007
- ERRG-FS-003 – SOP for Chain-of-Custody Documentation, 4/14/2007
- ERRG-FS-004 – SOP for Custody Seals, 4/14/2007
- ERRG-FS-005 – SOP for Sample Labeling, 4/14/2007
- ERRG-FS-008 – SOP for Packaging and Shipping of Nonhazardous Samples, 4/14/2007
- ERRG-FS-050 – SOP for Soil Vapor Sampling Using Summa Canisters, 8/24/2009
- ERRG-FS-051 – SOP for Soil Sampling Using an Excavator Bucket and Brass Sleeve, 9/8/2009
- ERRG-FS-016 – SOP for Sampling VOCs in Soil Using an EnCore® Sampler, 4/14/2007
- ERRG-FS-010 – SOP for Decontamination of Contact Sampling Equipment, 4/14/2007
- ERRG-FS-011– SOP for Data Usability Review, 4/14/2007

Title: **Field Logbook**

Document Number: **FS-001**

Revision Number: **0**

Reason for Revision:

Reviewed:	QC Manager	9/9/2009 Date
Approved:	Program Manager	9/9/2009 Date

ERRG

Field Logbook

1. Purpose

The objective of this Standard Operating Procedure (SOP) is to set criteria for content entry and form of field logbooks.

2. Scope

This procedure is applicable during all Engineering/Remediation Resources Group, Inc. (ERRG) site operations.

3. References

- Nielsen Environmental Field School, 1997. "Field Notebook Guidelines."

4. Definitions

Site Logbook—Logbook that is an index of all activities performed at the site. Specific entries are summaries of each day's activities. It is part of the project file.

Field Logbook—Logbooks used at field sites that contain detailed information on site activities, including dates, times, personnel names, activities conducted, equipment used, weather conditions, etc. Field logbooks are used by a variety of different field personnel and are part of the project file.

5. Responsibilities

5.1. PROCEDURE RESPONSIBILITY

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this SOP. Questions, comments, or suggestions on this SOP should be sent to the Field Sampling Discipline Lead.

5.2. PROJECT RESPONSIBILITY

ERRG employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. ERRG employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (i.e., checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. Procedure

6.1. GENERAL

Each site or operation, as applicable, will have one current Site Logbook, which will serve as an index of all activities performed at the site. It is initiated at the start of the first on-site activity. Summary entries are made for every day that on-site activities take place. The details of all field activities shall be recorded in separate field logbooks. Multiple field logbooks may be used depending upon the number of different types of field personnel conducting activities at the site. These field logbooks and the site logbook shall be made part of the project files.

Information recorded in field logbooks includes observations, data, calculations, time, weather, and descriptions of the data collection activity, methods, instruments, and results. Additionally, the field logbook may contain descriptions of wastes, biota, geologic material, and site features including sketches, maps, or drawings as appropriate.

6.2. EQUIPMENT AND MATERIALS

- Site logbook
- Site-specific plans
- Hard-covered, waterproof field logbook(s)
- Indelible black ink pen
- Ruler or similar scale

6.3. PREPARATION

Site personnel responsible for maintaining field logbooks must be familiar with the SOPs for all tasks to be performed. The field logbook will be assigned to an individual responsible for its care and maintenance. Field logbooks are project files and should remain with project documentation when not in use. Field logbooks shall be bound with lined, consecutively numbered pages. All pages must be numbered prior to initial use of the field logbook.

The following information shall be recorded inside the front cover of the field logbook:

- Person and organization to whom the book is assigned
- Phone number(s)
- Start date
- Project name
- ERRG project number
- Project Superintendent's name
- Sequential book number (if applicable)

The first five pages of the field logbook shall be reserved for a table of contents. Mark the first page with the heading and enter the following:

TABLE OF CONTENTS

Date/Description	Page
(Start Date/Reserved for TOC)	1-5

The remaining pages of the Table of Contents will be designated as such with "TOC" written on the top center of each page.

6.4. OPERATION

The following requirements must be met when using a field logbook:

- Record work, observations, quantities of materials, calculations, drawings, and related information directly in the field logbook. If data collection forms are specified by an activity specific work plan, the information on the form need not be duplicated in the field logbook.
- However, any forms used to record site information must be referenced in the field logbook.
- Information should be factual and unbiased.
- Do not start a new page until the previous one is full or has been marked with a single diagonal line so that additional entries cannot be made. Use both sides of each page.
- Write in black, indelible ink. Do not write in pencil unless working in wet conditions.
- Do not erase or blot out any entry. Before an entry has been signed and dated, changes may be made; however, care must be taken not to obliterate what was written originally. Indicate any deletion by a single line through the material to be deleted. A change should be initiated and coded using one of the common data error codes shown in Attachment 1. All error codes should be circled.
- Do not remove any pages from the book.
- Do not use loose paper and copy into the field logbook later.
- Record sufficient information to completely document field activities.
- All entries should be neat and legible.

Specific requirements for field logbook entries include the following:

- Initial and date each page.
- Sign and date the final page of entries for each day.
- Initial and date all changes.
- Multiple authors must sign out the field logbook by inserting the following:

Above notes authored by:

____ (Sign Name)

____ (Print Name)

____ (Date)

- A new author must sign and print his/her name before additional entries are made.
- Draw a diagonal line through the remainder of the final page at the end of the day.
- Record the following information on a daily basis:
  - Date and time
  - Name of individual making entry
  - Description of activity being conducted including well, boring, sampling, location number as appropriate
  - Unusual site conditions
  - Weather conditions (i.e., temperature, cloud cover, precipitation, wind direction, and speed) and other pertinent data
  - People on site
  - Level of personal protection to be used
  - Arrival and departure of site visitors
  - Arrival and departure of equipment
  - Sample pickup (chain-of-custody form numbers, carrier, time)
  - Sampling activities and sample log sheet numbers
  - Start and completion of borehole, trench, and monitoring well installation or sampling activity
  - Health and Safety issues
  - Instrumentation calibration details

Entries into the field logbook shall be preceded with the time of the observation. The time should be recorded frequently and at the point of events or measurements that are critical to the activity being logged. All measurements made and samples collected must be recorded unless they are documented by automatic methods (e.g., data logger) or on a separate form required by an operating procedure. In such cases, the field logbook must reference the automatic data record or form.

While sampling, record observations such as color and odor. Indicate the locations from which samples are being taken, sample identification numbers, the order of filling bottles, sample volumes, and parameters to be analyzed. If field duplicate samples are being collected, note the duplicate pair sample identification numbers. If samples are collected that will be used for matrix spike and matrix spike/matrix spike duplicate analysis, record that information in the field logbook.

A sketch of the station location may be warranted. All maps or sketches made in the field logbook should have descriptions of the features shown and a direction indicator. Maps and sketches should be oriented so that north is towards the top of the page.

Other events and observations that should be recorded include (but are not limited to) the following:

- Changes in weather that impact field activities
- Subcontractor activities
- Deviations from procedures outlined in any governing documents, including the reason for the deviation
- Problems, downtime, or delays
- Upgrade or downgrade of personal protective equipment

6.5. POST-OPERATION

To guard against loss of data due to damage or disappearance of field logbooks, copies of completed logbooks shall be securely stored by the project.

At the conclusion of each activity or phase of site work, the individual responsible for the field logbook will ensure that all entries have been appropriately signed and dated, and that corrections were made properly (single lines drawn through incorrect information, then initialed, coded, and dated). The completed field logbook shall be submitted to the project records file.

6.6. RESTRICTIONS AND LIMITATIONS

Field logbooks constitute the official record of on-site technical work, investigations, and data collection activities. Their use, control, and ownership are restricted to activities pertaining to specific field operations carried out by ERRG personnel and their subcontractors. They are documents that may be used in court to indicate and defend dates, personnel, procedures, and techniques employed during site activities. Entries made in these notebooks should be factual, clear, precise, and as nonsubjective as possible. Field logbooks, and entries within, are not to be used for personal use.

7. Attachments

- Attachment 1—Common Data Error Codes.

1. Forms

None.

ATTACHMENT 1

COMMON DATA ERROR CODES

COMMON DATA ERROR CODES

- RE Recording Error
- CE Calculation Error
- TE Transcription Error
- SE Spelling Error
- CL Changed for Clarity
- DC Original Sample Description Changed After Further Evaluation
- WO Write Over
- NI Not Initialed and Dated at Time of Entry
- OB Not Recorded at the Time of Initial Observation

All Error Codes should be circled

Title:	**Field Logsheet**
Document Number:	**FS-002**
Revision Number:	**0**
Reason for Revision:	

Reviewed:	QC Manager	9/9/2009 Date
Approved:	Program Manager	9/9/2009 Date

ERRG

Field Logsheet

1. Purpose

The purpose of this standard operating procedure (SOP) is to identify the minimum information that should be collected during sampling activities. Samples can be collected at a project site for various reasons, including evaluation of the nature and extent of contamination, risk assessment, permit compliance, and confirmation of site cleanup. Information on sampling locations and techniques is just as important as sample collection, since it allows future data users to determine whether sample data are appropriate for their intended use.

2. Scope

This SOP is applicable to all Engineering/Remediation Resources Group, Inc. (ERRG) projects where vapor, water, or solid samples are collected.

3. References

- U.S. Environmental Protection Agency (EPA), 2002. "Guidance for Quality Assurance Project Plans, EPA QA/G-5." EPA/240/R-02/009. Washington, DC. Available Online at: <http://epa.gov/quality/qs-docs/g5-final.pdf>.
- U.S. Army Corps of Engineers, 2001. "Requirements for the Preparation of Sampling and Analysis Plans, EM200-1-3." Washington, D.C. February.

4. Definitions

None.

5. Responsibilities

5.1. PROCEDURE RESPONSIBILITY

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this SOP. Questions, comments, or suggestions on this SOP should be sent to the Field Sampling Discipline Lead.

5.2. PROJECT RESPONSIBILITY

ERRG employees performing this task, or any portion thereof, are responsible for meeting the requirements of this SOP. ERRG employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate SOPs. Project participants are responsible for documenting information in sufficient detail to provide

objective documentation (i.e., checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. Procedure

Field logsheets can be prepared to address the specific needs of each project. All field logsheets are to be completed in black indelible ink. Any corrections are to be made by single line cross out of the incorrect information and placement of the edited data above or beside the incorrect data. The following information is the minimum that should be included on the logsheet:

6.1. SITE INFORMATION

- Site name
- Project number
- Weather conditions

6.2. SAMPLE INFORMATION

- Date
- Time of sample collection
- Name of field technician
- Media being sampled
- Sample location (sketch as appropriate)
- Associated photograph log number (as appropriate)
- GPS (global positioning system) reading (as appropriate)
- Sample number
- Sample description
- Preservative (if any)
- Comments and observations (if any)
- QC samples collected

6.3. EQUIPMENT INFORMATION

- Equipment used to collect sample
- Equipment decontamination technique
- Field instrument calibration
- Field instrument readings

6.4. ANALYTICAL

- Analysis to be performed
- Analytical laboratory

7. Attachments

None.

8. Forms

- Sample Logsheet
- Low Flow Groundwater Logsheet
- Groundwater Logsheet

SAMPLE LOGSHEET

Prepared by: ______________________ Client: ______________

Project Name: ______________________ Project No.: ______________

Weather ______________________

Site Location: ______________________ Page: ________ of ________

	Sample	Sample	Description		Sampling Equip.	COC	
Sample Date	Location	ID	eg.waste,rinse	Analysis	eg. Trowel, T-handle	#	Sampler

SAMPLE LOGSHEET

Prepared by:		Client:	
Project Name:		Project No.:	
Weather			
Site Location:		Page:	of

Sample Location (Sketch)

PROJECT NO: ____________________
DATE: ____________________
CLIENT NAME ____________________
LOCATION: ____________________
ARRIVAL TIME: ____________________

WELL ID: ____________________
SAMPLE ID: ____________________
PURGED BY: ____________________
DEPARTURE TIME: ____________________

ERRG
115 Sansome Street, Suite 200
San Francisco, CA 94104
Phone: (415) 395-9974

Casing Diameter (inches):	2": ____	3": ____	4": ____	5": ____	6": ____	8": ____	Other: ____
Casing Volume (gal/ft):	(0.17)	(0.38)	(0.66)	(1.02)	(1.05)	(2.60)	( )

Total Depth (feet) = ____________ Depth to Water (feet): ____________ Depth to Product (feet): ____________

______ - ______ = ____________ x ____________ = ______ x ______ = ______
TD DTW Casing volume No. of casing volumes Calculated Purge

Time Started: ____________ Time ended: ____________

Time (2400hr)	Depth to Water (ft)	Refill Time (sec)	Discharge Time (sec)	Pressure (psi)	Flowrate (L/min)	Volume (gal)	Temp. (oF)	Sp. Cond. (mS/cm)	pH (units)	D.O. (mg/L)	Salinity (%)	Turbidity (NTU)	ORP (mV)	Odor (Y/N)	Pumped Dry (Y/N)
Criteria	±0.33ft				0.1 to 1.0		±3%	±5%	±0.2 units	±0.2 mg/L		±10%	+20 mV		

Actual gallons purged: ____________ Sample Time: ____________

PURGING EQUIPMENT

Active Extraction Well Pump ______ ______ Bailer (Teflon)
Portable Submersible Pump ______ ______ Bailer (PVC)
Other: ______ ______ Bailer (Stain. Steel)
Pump Depth: ______ ______ Dedicated

SAMPLING EQUIPMENT

Sampling Port ___ ___ Bailer (Teflon)
Portable Submersible Pump ___ ___ Bailer (PVC)
Peristaltic Pump ___ ___ Bailer (Stainless Steel)
___ Other: ______

Well Integrity: Good: [ ] Fair: [ ] Poor: [ ] Lock No. ____________
Remarks: ____________________

Signature: ____________ Reviewed by ____________ Page ____ of ____

ERRG
115 Sansome Street, Suite 200
San Francisco, CA 94104
Phone: (415) 395-9974

PROJECT NO: ______________ WELL ID: ______________
DATE: ______________ SAMPLE ID: ______________
CLIENT NAME ______________ PURGED BY: ______________
LOCATION: ______________ SAMPLED BY: ______________
ARRIVAL TIME: ______________ DEPARTURE TIME: ______________

Casing Diameter: 2" ____ 3" ____ 4" ____ 5" ____ 6" ____ 8" ____ Other: ____
Casing Volume: (0.17) (0.38) (0.66) (1.02) (1.05) (2.60) (   )

Total Depth (feet) = ______ Depth to Water (feet): ______ Depth to Product (feet): ______

______ - ______ = ______ x ______ = ______ x ______ = ______
TD DTW Casing volume No. of casing volumes Calculate d Purge

Time Started: ______________ Time ended: ______________

Time (2400hr)	Volume (gal)	Temp. (^{o}F)	Conductivity (µmhos/cm)	pH (units)	D.O. (mg/L)	Turbidity (NTU)	ORP (mV)	Odor (Y/N)	Depth to Water (ft)	Pumped Dry (Y/N)

Actual gallons purged: ______________ Sample Time: ______________

PURGING EQUIPMENT

Active Extraction Well Pump ___ ___ Bailer (Teflon)
Portable Submersible Pump ___ ___ Bailer (PVC)
Other: ___ ___ Bailer (Stain. Steel)
Pump Depth: ______ ___ Dedicated

SAMPLING EQUIPMENT

Sampling Port ___ ___ Bailer (Teflon)
Portable Submersible Pump ___ ___ Bailer (PVC)
Peristaltic Pump ___ ___ Bailer (Stainless Steel)
___ Other: ______

Well Integrity: Good: ☐ Fair: ☐ Poor: ☐ Lock No. ______________

Remarks: ______________________________

Signature: ______________ Reviewed by ______________

Title:	**Chain-of-Custody Documentation**
Document Number:	**FS-003**
Revision Number:	**0**
Reason for Revision:	

Reviewed:	QC Manager	9/9/2009 Date
Approved:	Program Manager	9/9/2009 Date

Chain-of-Custody Documentation

1. Purpose

The purpose of this standard operating procedure (SOP) is to provide the requirements for completion of written chain-of-custody (COC) documentation and to provide a suggested COC form for project use.

2. Scope

This SOP is applicable to all Engineering/Remediation Resources Group, Inc. (ERRG) efforts where samples are transferred among parties, including to off-site testing facilities. Adherence to this SOP is not required whenever the same individual and team is performing sampling and testing within the same workday and transfer to the testing process is being documented by other means (e.g., sampling and then field-screening in a mobile laboratory).

3. References

- U.S. Environmental Protection Agency (EPA), 2008. "Test Methods for Evaluating Solid Waste; Physical/Chemical Methods, SW-846." Available Online at: <http://www.epa.gov/epawaste/hazard/testmethods/sw846/online/index.htm>.

- U.S. Army Corps of Engineers, 2001. "Requirements for the Preparation of Sampling and Analysis Plans, EM200-1-3." February.

4. Definitions

Custody—The legal term used to define control and evidence of traceability of an environmental sample. A sample is considered to be in an individual's custody when it is in actual physical possession of the person, is in view of the person, is locked in a container controlled by the person, or has been placed into a designated secure area by the person.

Chain-of-Custody Form—A form used to document and track custody and transfers of a sample from collection to analysis or placement in a designated secure area within the testing facility.

Chain-of-Custody Continuation Page—Additional page(s) that may be included with a COC form. The continuation page contains information on additional samples contained within the same cooler and shipping container associated with the cooler and shipping container COC form.

5. Responsibilities

5.1. PROCEDURE RESPONSIBILITY

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this SOP. Questions, comments, or suggestions on this SOP should be directed to the Field Sampling Discipline Lead.

5.2. PROJECT RESPONSIBILITY

ERRG employees performing this task, or any portion thereof, are responsible for meeting the requirements of this SOP. ERRG employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate SOPs. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (i.e., checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. Procedure

6.1. DOCUMENTATION

All COC documentation must be completed in indelible ink. All corrections must be performed using standard single-line cross-out methods, and the initials of the individual making the change must be included beside the corrected entry.

6.2. CONTINUATION PAGES

Continuation pages may be used for shipping containers and coolers with sufficient samples and sample containers that all of the lines of the COC form are used before the documentation of the cooler and shipping container is complete. The number of pages in total must be filled out. All samples entered onto a Continuation Page must be included in the same cooler and shipping container as those on the COC form itself.

6.3. HEADER INFORMATION

- Each COC form must be assigned a unique Reference Document Number—use the project and proposal number followed by a unique numeric sequence or current date (if only one cooler sent per day). Continuation Pages should contain the same Document Reference Number as the COC form that they are associated with. The project team should maintain a log of COC Reference Document Numbers.
- The page identifier and total page count section must be completed. Total pages include the COC form and any attached Continuation Pages.
- Project number, name, and location information must be completed for all forms.
- If available, the laboratory Purchase Order Number should be included on the appropriate line.
- The name and phone number of the Project Contact should be included; the Project Contact should be a responsible individual that the laboratory may access to address analytical issues. This person is usually the analytical lead for the project.
- The shipment date should be provided on the applicable lines.

- If shipping by carrier, the waybill and airbill number must be included. (Note: couriers will not sign custody documents. Therefore, inclusion of the waybill and airbill number on the COC form is the only means of documenting the transfer to the carrier.)
- Laboratory Destination and Contact information should be provided.
- The Sampler(s) names should be provided on the appropriate line. This line should include all persons whose initials appear on any of the sample containers to provide the laboratory a means of cross-referencing containers.
- The "Send Report To" information should be completed. If multiple reports and locations are needed, the information should be provided on a separate page included with the COC documentation.

6.4. SAMPLE INFORMATION SECTION (INCLUDING ON CONTINUATION PAGE)

During sampling, each sample must be entered on the COC form at the time of collection to document possession of the sample. The sampler must not wait until sampling is completed before entering samples on the COC.

- Complete the sample ID number for each line. If there are multiple container types for a sample, use additional lines to indicate the needed information.
- Ensure that the sample description matches the description on the sample label; the laboratory will use this information for cross-referencing.
- Provide the collection date and time, which must match those on the sample label and field logbook and logsheets.
- Indicate whether the sample is a grab or composite sample.
- Indicate the matrix of the sample. Use the matrix codes listed on the COC form.
- Indicate the number of containers and the container type. If a sample has multiple container types, use multiple lines.
- Check the appropriate preservative box for each line and container type.
- Write in and check the analyses requested boxes for each line and container type. The appropriate method number (e.g., EPA Method 8260C) must be written, as well as the method name.
- Indicate the turnaround time requested for each sample.
- Use the special instructions section to provide important information to the laboratory (e.g., samples that may require dilution or samples that will need to be composited by the laboratory). This section may also be used to inform the laboratory of additional information contained in attachments to the COC documentation.
- Circle the appropriate quality control (QC) and data package level requested.

6.5. CUSTODY TRANSFER SECTION

- The first "Relinquished By" space must be completed by the individual who will either transfer the samples or seal the shipping container.
- If the samples will be transferred to a courier, write the courier and carrier company in the "Received By" box and enter the date and time the shipping container was closed.
- All other transfers must be performed in person, and the relinquisher must witness the signing by the receiver.
- A copy of the COC form and all associated continuation pages should be maintained in the project files.

7. Attachments

None.

8. Forms

- ERRG Chain-of-Custody Form

ERRG

Engineering / Remediation Resources Group, Inc.
115 Sansome St., Suite 200
San Francisco, CA 94104
Phone: (415) 395-9974
Fax: : (415) 395-9983

Lab No. ____________
Address ____________

Page ____ of ____

Chain-of-Custody Record and Analysis Request

Project Contact (Hardcopy or PDF To):

California EDF Report? ☐ Yes ☐ No
Navy EDD Report? ☐ Yes ☐ No

Laboratory:

Electronic Deliverables To (Email Address):

Phone No.: **Fax No.:**

Sampler :

Project Number: **Phase # / Task #**

Project Name:

Project Address:

Project Manager:

Sample Designation	Sampling: Date	Sampling: Time	Container					Matrix: Soil	Matrix: Water	Matrix	Analysis Request										12 hr/ 24 hr/ 48 hr/ 72 hr/STD (1 wk) TAT	Number of Containers	Comments	For Lab Use Only
1.																								
2.																								
3.																								
4.																								
5.																								
6.																								
7.																								
8.																								
9.																								
10.																								

Relinquished by:	Date	Time	Received by:
Relinquished by:	Date	Time	Received by:
Relinquished by:	Date	Time	Received by Laboratory:

Remarks:

Bill to: **Engineering / Remediation Resources Group, Inc.**
4585 Pacheco Blvd, Suite 200
Martinez, CA 94553

Title: **Custody Seals**

Document Number: **FS-004**

Revision Number: **0**

Reason for Revision:

Reviewed: ______________________ 9/9/2009
QC Manager Date

Approved: ______________________ 9/9/2009
Program Manager Date

Custody Seals

1. Purpose

The purpose of this standard operating procedure (SOP) is to provide requirements for completion and attachment of Custody Seals on environmental samples and shipping containers.

2. Scope

This SOP is applicable to all Engineering/Remediation Resources Group, Inc. (ERRG) efforts where sample legal defensibility and custody integrity is desired. Adherence to this SOP is not required whenever the same individual and team is performing the sampling and testing within the same workday and transfer to the testing process is being documented by other means (i.e., sampling and then field-screening in a mobile laboratory).

3. References

- U.S. Environmental Protection Agency (EPA), 2008. "Test Methods for Evaluating Solid Waste; Physical/Chemical Methods, SW-846." Available Online at: <http://www.epa.gov/epawaste/hazard/testmethods/sw846/online/index.htm>.
- U.S. Army Corps of Engineers, 2001. "Requirements for the Preparation of Sampling and Analysis Plans, EM200-1-3." February.

4. Definitions

Custody—The legal term used to define control and evidence of traceability of an environmental sample. A sample is considered to be in one's custody if it is in actual physical possession of the person, is in view of the person, has been locked in a container controlled by the person, or has been placed into a designated secure area by the person.

Custody Seal—Commercially available thin strips of adhesive paper with write-in lines for the date and time and identification of the using party. Custody seals are placed over the caps of sample containers and along the cover seals of shipping containers as a means to detect tampering before arrival at the testing facility. All of ERRG's laboratories provide Custody Seals in their sample container supply kits.

5. Responsibilities

5.1. PROCEDURE RESPONSIBILITY

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this SOP. Questions, comments, or suggestions on this technical SOP should be sent to the Field Sampling Discipline Lead.

5.2. PROJECT RESPONSIBILITY

ERRG employees performing this task, or any portion thereof, are responsible for meeting the requirements of this SOP. ERRG employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (i.e., checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. Procedure

6.1. COMPLETING THE CUSTODY SEAL INFORMATION

- All Custody Seals must be completed in indelible ink. All corrections must be made using standard single-line cross-out methods, and the initials of the individual making the change must be included beside the corrected entry.
- Each Custody Seal attached must be completed by writing the date, at a minimum, and signing with full signature by the person responsible for the sealing of the sample.
- If a space is provided, the time should also be added.

6.2. ATTACHING THE CUSTODY SEALS

Whenever possible, custody seals should be attached over the sample container lids during actual sampling and not when the samples are packaged for shipment. This step will provide confidence in legal custody and will demonstrate nontampering during the sample collection process.

Do not attach custody seals to volatile organic compound (VOC) sample containers because contamination may occur. For VOC sample containers, the custody seal should be used to seal the folded plastic zip bag that holds the sample containers.

- For sample jars, the completed custody seal should be placed across the top of the lid with the edges below the lid and jar interface and attached to the jar material. This step will require the visible breaking of the seal to open the container.
- Sample coolers and shipping containers should have Custody Seals attached in such a manner that the seal extends lengthwise from the top edge of the lid to the side of the cooler and container.

7. Attachments

None.

8. Forms

None.

Title: **Sample Testing**

Document Number: **FS-005**

Revision Number: **0**

Reason for Revision:

Reviewed: ______________________ 9/9/2009

QC Manager Date

Approved: ______________________ 9/9/2009

Program Manager Date

1. Purpose

The purpose of this standard operating procedure (SOP) is to provide requirements for completion and attachment of sample labels on environmental sample containers.

2. Scope

This SOP is applicable to all Engineering/Remediation Resources Group, Inc. (ERRG) projects where soil samples will be collected via hand auger methods.

3. References

- U.S. Environmental Protection Agency (EPA), 2008. "Test Methods for Evaluating Solid Waste; Physical/Chemical Methods, SW-846." Available Online at: <http://www.epa.gov/epawaste/hazard/testmethods/sw846/online/index.htm>.
- U.S. Army Corps of Engineers, 2001. "Requirements for the Preparation of Sampling and Analysis Plans, EM200-1-3." Washington, DC. February.

4. Definitions

Sample Label—Any writing surface with an adhesive backing that can be used to document sample identification information. The sample label is attached to the sample container as a means of identification and, in some commercially available or laboratory-supplied containers, may be preattached. All ERRG laboratories provide sample labels or prelabeled containers in their sample container supply kits.

5. Responsibilities

5.1. PROCEDURE RESPONSIBILITY

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this SOP. Questions, comments, or suggestions on this SOP should be sent to the Field Sampling Discipline Lead.

5.2. PROJECT RESPONSIBILITY

ERRG employees performing this task, or any portion thereof, are responsible for meeting the requirements of this SOP. ERRG employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate SOPs. Project participants are responsible for documenting information in sufficient detail to provide

objective documentation (i.e., checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. Procedure

- All sample labels must be completed in indelible ink. All corrections must be performed using standard single-line cross-out methods, and the initials of the individual making the change must be included beside the corrected entry.
- Sample labels should be completed and attached as samples are collected. Do not wait until final packaging to attach and complete the sample labels.
- Sample labels must be attached to the nonsealing portion of the container. Do not place labels on or across sample container caps.
- If the laboratory has provided prelabeled containers, make sure to fill one for each parameter set needed. Laboratory prelabeled containers are often bar coded, and it is important to provide a complete container set for each sample.
- The following information must be recorded on the sample label:
  - Sample identification number
  - Date and time collected
  - Initials of person(s) responsible for collection
- If a space is provided, the “Analysis Requested” should also be added.
- If a description is provided, remember it must match that on the chain-of-custody form for cross-referencing purposes.
- Cover the completed and attached label with clear plastic tape to prevent bleeding of the ink if it becomes wet.

7. Attachments

None.

8. Forms

None.

Title: **Shipping and Packaging of Nonhazardous Samples**

Document Number: **FS-008**

Revision Number: **0**

Reason for Revision:

Reviewed: ______________________ 9/9/2009
QC Manager Date

Approved: ______________________ 9/9/2009
Program Manager Date

Shipping and Packaging of Nonhazardous Samples

1. Purpose

The purpose of this standard operating procedure (SOP) is to provide general instructions in the packaging and shipping of nonhazardous samples. The primary use of this SOP is for transportation of samples collected on site to be sent off site for physical, chemical, and radiological analysis.

2. Scope

This procedure applies to shipping and packing of all nonhazardous samples. Nonhazardous samples are those that do not meet any hazard class definitions found in Title 49 Code of Federal Regulations (49 CFR) Parts 107 through 178, including materials designated as Class 9 materials and materials that represent Reportable Quantities (hazardous substances).

In general, most soil, air, and aqueous samples do not meet any of the Department of Transportation's (DOT) hazardous materials definitions. However, samples for which screening has shown a potential hazard sufficient to meet a DOT definition or that are derived from a source known or suspected to meet a DOT definition must be packaged and shipped in accordance with the applicable DOT and International Air Transport Association (IATA) requirements. Refer to ERRG SOP FS-009, "Packaging and Shipping of DOT-Hazardous Samples."

3. References

- U.S. Army Corps of Engineers, 2001. "Requirements for the Preparation of Sampling and Analysis Plans, EM200-1-3." Washington, DC. February.
- U.S. Department of Transportation Regulations, 49 CFR Parts 107 through 178
- IATA, Dangerous Goods Regulations Manual, current edition.

4. Definitions

Cooler and Shipping Container—Any hard-sided insulated container meeting DOT's or IATA's general packaging requirements.

Bubble Wrap—Plastic sheeting with entrained air bubbles for protective packaging purposes.

5. Responsibilities

5.1. PROCEDURE RESPONSIBILITY

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this SOP. Questions, comments, or suggestions on this SOP should be sent to the Field Sampling Discipline Lead.

5.2. PROJECT RESPONSIBILITY

Engineering/Remediation Resources Group, Inc. (ERRG) employees performing this task, or any portion thereof, are responsible for meeting the requirements of this SOP. ERRG employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate SOPs. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (i.e., checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. Procedure

6.1. PACKAGING

- Ensure that the cooler is labeled or marked “For Samples Only”.
- Use tape and seal off the cooler drain on the inside and outside to prevent leakage.
- Place packing material on the bottom on the shipping container (cooler) to provide a soft impact surface.
- Starting with the largest glass containers, wrap each container with sufficient bubble wrap to ensure the best chance to prevent breakage of the container.
- Pack the largest glass containers in bottom of the cooler, placing packing material between each of the containers to avoid breakage from bumping.
- Double-bag the ice (chips or cubes) in gallon or quart freezer zip-lock plastic bags and wedge the ice bags between the sample bottles.
- Add bagged ice across the top of the samples.
- When sufficiently full, seal the inner protective plastic bag, and place additional packing material on top of the bag to minimize shifting of containers during shipment.
- Tape a gallon zip-lock bag to the inside of the cooler lid, place the completed chain-of-custody form inside and seal it shut.
- Tape the shipping container (cooler) shut using packing tape, duct tape, or other tear-resistant adhesive strips. Taping should be performed to ensure the lid cannot open during transport.
- Place a custody seal on two separate portions of the cooler, to provide evidence that the lid has not been opened prior to receipt by the intended recipient.

6.2. LABELING

- A “This Side Up” arrow must be adhered to all sides of the cooler.
- The name and address of the receiver and the shipper must be on the top of the cooler.
- The airbill must be attached to the top of the cooler.

6.3. SHIPPING DOCUMENTATION

- A Cooler Shipment Checklist should be completed and kept in the project file.

7. Attachments

None.

8. Forms

None.

Title: **Soil Vapor Sampling Using Summa Canisters**

Document Number: **FS-050**

Revision Number: **0**

Reason for Revision:

Reviewed: ______________________ 8/24/2009
QC Manager Date

Approved: ______________________ 8/24/2009
Program Manager Date

Procedure No:	FS-050
Revision No:	1
Date of Revision:	8/13//2009
Review Date:	8/23/2009

Soil Vapor Sampling Using Summa Canisters

1. Purpose

This standard operating procedure (SOP) provides the standard practice for soil vapor sampling using Summa canisters. This SOP includes the minimum required steps and quality checks that employees and subcontractors are to follow when collecting soil gas samples.

2. Scope

This SOP is applicable to all Engineering/Remediation Resources Group, Inc. (ERRG) efforts where soil vapor samples are collected using Summa canisters. This SOP was developed using applicable regulatory guidance documents and describes technical requirements and required documentation.

3. References

The following documents were used to create this SOP:

- Air Toxics Ltd, 1989. "Guide to Air Sampling & Analysis: Canisters and Tedlar Bags."
- H&P Mobile Geochemistry Inc. "Instruction for Collecting Soil Vapor into Summa Canisters"
- Department of Toxic Substance Control (DTSC), 2003. "Advisory - Active Soil Gas Investigations."
- DTSC, 2009. "Introduction to the 2009 Active Soil Gas Advisory." June 2009 Vapor Intrusion Workshop.
- U.S. Environmental Protection Agency [EPA]. "Summa Canister Field Standards. SOP #1706, Rev. #0.0," 09/12/94.
- U.S. EPA. "Summa Canister Sampling. SOP #1704, Rev. #0.1" 07/27/95.

4. Definitions

Associated canister hardware — Associated canister hardware includes the valve, brass cap, particulate filter, manifold, mass flow controller, and vacuum gauge.

Brass cap — Each Summa canister is equipped with a brass cap to secure the inlet of the valve assembly. The cap ensures that 1) there is no vacuum loss due to a leaky valve or accidental opening during handling and 2) prevents dust and other particulate matter from fouling the valve. The cap is removed prior to sampling and replaced after sample collection.

Flow controllers — Flow controllers are utilized to control the flow of air during sampling into the evacuated canister. A mass flow controller uses a diaphragm that actively compensates to maintain a constant mass flow rate. As the differential pressure decreases, the flow rate will decrease and the diaphragm responds by opening up to allow more air to pass through. Devices are driven by differential pressure between ambient conditions and the vacuum within the canister. Flow controllers are used with integrated samples and can provide sampling intervals of hours to days. Some controllers are calibrated for a specific flow rate in the laboratory and others are adjustable in the field. Air samples collected from a process (pressurized or under vacuum) or at elevation, may fill faster or slower depending on sample conditions (Air Toxics Ltd, 1989). Flow controllers should be used once and returned for cleaning after use.

Particulate filter — A particulate filter should always be used when sampling soil vapor. Filters can be provided in different sizes and can be built into flow controllers. These devices prevent entry of particulates greater than the designated filter size. Filters are not calibrated devices and therefore the flow rates can and do vary for each filter. Filters should only be used once during sampling (to prevent cross contamination between samples) and returned to the analytical laboratory for cleaning after use.

Purge Volume — Purge volume (i.e., dead space volume) includes, 1) the internal volume of the tubing used, and 2) the annular space around the probe tip. The purge volume must be calculated and documented in the field logbook before the purge test and sampling is conducted. The following formula applies to calculating volume in the tubing: $Volume = pi \times radius^2 \times length$. The result is then added to the annular tip volume to arrive at the total purge volume.

Sample Tubing — Sample tubing materials should not react or interact with site contaminants. Common tubing used include Teflon, Tygon, and stainless steel. The DTSC no longer recommends copper or low density polyethylene tubing. Clean, dry tubing should be utilized at all times. If moisture, water, or an unknown material is present in the probe prior to insertion, the tubing should be decontaminated or replaced.

Step Purge Test — Step purge tests are conducted as a means to determine the purge volume to be applied at all sample locations. DTSC recommends three step purge tests at 1, 3, and 10 purge volumes. The appropriate purge volume for sampling should be selected based on the highest concentration of the COCs.

Summa Canister — Summa canisters are stainless steel containers that have had their internal surfaces specially passivated using a "Summa" process. They are used because they are gas-tight and dark so that light-sensitive or halogenated volatile organic compounds (VOCs) will not degrade (DTSC, 2009) The Summa process combines an electropolishing step with a chemical deactivation step to produce an internal surface that is chemically inert, which is crucial to minimizing reactions with the sample and maximizing recovery of target compounds from the container. Summa canisters can be various sizes. The analytical laboratory performs an analysis-specific Summa certification prior to delivery of containers.

Vacuum gauge — The vacuum gauge is used to measure the initial and final vacuums of the canister before and after sampling. A gauge can also be used to monitor the fill rate of the canister when collecting an integrated sample (time dependent). There are typically two types of gauges: test gauge (used on grab samples to collect initial or final vacuum readings and should not be sampled through) or an integrated gauge (combined with flow controller) to monitor initial and final vacuum and fill rate. Gauges are not calibrated and give only approximate values.

Valve — The valve is a standard ¼-inch stainless steel bellows valve and is mounted on top of the Summa canister. The valve allows a vacuum to be maintained prior to sampling and seals off the canister once the vacuum test is done or the sample has been collected. The valve should be opened by turning one half turn by hand. Do not over tighten the valve or it may become damaged, causing a leak that would deplete the vacuum in the canister, thereby rendering the Summa canister useless.

5. Responsibilities

5.1. PROCEDURE RESPONSIBILITY

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this SOP. Questions, comments, or suggestions on this SOP should be sent to the Field Sampling Discipline Lead.

ERRG employees performing this task, or any portion thereof, are responsible for meeting the requirements of this SOP. ERRG employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

5.2. PROJECT RESPONSIBILITY

ERRG employees performing this task, or any portion thereof, are responsible for meeting the requirements of this SOP. ERRG employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate technical guidance or regulatory requirements. Project participants are responsible for documenting information in sufficient detail to provide objective documentation that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. Procedure

6.1. SELECTION OF SOIL GAS SAMPLING LOCATIONS AND DEPTHS

Land use, weather conditions, surface cover and hydrogeology are all important factors to consider when selecting locations and depths of soil gas probes. Sample depths should be selected to minimize the effects of changes in barometric pressure, temperature, or breakthrough of ambient air from the surface, and to ensure that representative samples are collected. The following elements should be considered during soil gas investigation planning and preparation:

- Soil gas sampling is intended to assess vapor intrusion impacts from soil and groundwater to existing or hypothetical future buildings. Therefore, sampling points should be laterally spaced to adequately represent soil gas concentrations proximate to such structures, taking into consideration the location and concentration of contamination relative to the structures.
- Subsurface soil gas concentrations are subject to greater ambient air breakthrough and effects from extreme weather conditions. A sudden storm event, for example, may cause dramatic fluctuations in temperature and pressure that may impact the representativeness of a soil gas sample collected beneath the surface. The effect by weather is amplified under unpaved areas compared to paved areas.
- Soil gas probes must not be installed below the water table. If groundwater levels are known at the site, then the deepest soil gas probe should be set above the capillary fringe. If groundwater levels are not known, soil samples should be collected periodically as the boring is advanced to document groundwater conditions.
- Soil gas probes must be installed deeper than 1.5 feet below ground surface (bgs). Samples collected shallower than 1.5 feet bgs are subject to ambient air intrusion and are not considered representative of subsurface conditions.
- Lithology and field screening instruments (e.g., Photoionization Detection [PID] or Flame Ionization Detector [FID]) should be used to guide selection of sampling depths. For example, it may be appropriate to target soil gas sampling in high-permeability soils, such as sand and gravel, which may exhibit high VOCs and may serve as possible preferential pathways.
- Soil gas sampling should not be conducted within 5 feet of marked or suspected subsurface utilities.
- Multiple-depth soil gas sampling (i.e., nested soil gas probes) may be appropriate based on the need to perform vertical profiling VOC impacts.

6.2. INSTALLATION OF SOIL GAS MONITORING PROBES

6.2.1. Drilling Methods

Permanent or temporary soil gas probes may be installed, using a variety of drilling methods. Boreholes may be advanced using direct push technology (DPT), hollow-stem auger drilling, hand auger, rotosonic, or air rotary methods. Note, however that the use of post-run tubing sampling systems is being discouraged. Air rotary and rotosonic methods can adversely affect soil gas data during and after drilling and will require extensive equilibration times to ensure collection of representative samples.

6.2.2. Soil Gas Probe Construction

Soil gas probes are most commonly constructed using small-diameter (1/8-inch to ¼-inch) sample tubing. This SOP discusses the procedures to follow for construction of soil gas probes using sample tubing. Other soil gas probe designs and construction methods (e.g., implants, PVC wells) may be appropriate but are not discussed specifically in this SOP.

Using the appropriate drilling method, the borehole is advanced to the targeted sampling depth. If soil gas probes will be installed at multiple depths within the same borehole, the borehole is initially advanced to the deepest sampling point and the deepest sampling probe is installed first. Attachment 1 depicts a typical schematic for both a single-probe and nested-probe construction. The following construction sequence should be followed (DTSC, 2003 and 2009):

- The soil vapor probe tip is placed midway between the top and bottom of the sampling interval within a sand pack extending 6 inches above and below the sampling interval (i.e., sand pack should be a minimum 1 foot thickness). The grain size of the sand pack should be appropriately sized (e.g., no smaller than the adjacent formation) and installed to minimize disruption of air flow to the sampling tip.
- At least 1 foot of dry granular bentonite should be placed on top of the sand pack to preclude the infiltration of hydrated bentonite grout into the sand pack (see Attachment 1).
- The borehole should be grouted to the surface with hydrated bentonite. Adequately sealing soil gas sampling probes is very important to minimize the exchange of atmospheric air with the soil gas and to maximize the representativeness of the sample. If conditions warrant shallow sampling depths, great care should be taken in installing the surface seal to limit atmospheric infiltration.
- If multiple sampling points are installed within a single borehole, the borehole must be grouted between sampling points. One foot of dry granular bentonite must be placed between the filter pack and the grout at each sampling location within the borehole, as illustrated by Attachment 1.
- The use of a downhole probe support (e.g., 1-inch PVC pipe or other solid rod) may be required for deep probe construction, typically deeper than 40 feet bgs
- Tubing must be properly marked at the surface to identify the probe depth.
- Unless soil gas probes are properly abandoned the same day they are installed, probes must be properly secured and capped to prevent infiltration of water or ambient air into the subsurface and to prevent damage or vandalism. The following components may be installed, as necessary:

    1) Gas-tight valve or fitting for capping the vapor point;
    2) Fitting for connection to above ground sampling equipment;
    3) Protective flush mounted or above ground well vaults, and/or
    4) Guard Posts

6.2.3. Decontamination Methods

After each use, drive rods and other reusable components should be properly decontaminated to prevent cross contamination. These methods include:

- 3-stage wash and rinse (e.g., wash equipment with a non-phosphate detergent, rinse with tap water, and final-rinse with distilled water); and/or
- Steam cleaning methods.

6.2.4. Equilibrium Timeframe

Borehole advancement and installation of the vapor probes causes disturbance of the subsurface conditions. Prior to soil gas sampling, the subsurface conditions must be given sufficient time to reach equilibrium. The amount of time required is dependent on the drilling method used. Recommended equilibrium timeframes are (DTSC, 2003 and 2009):

1. Soil vapor probes installed using DPT methods should be sampled no earlier than 30 minutes after installation
2. Probes installed using hollow stem auger or hand auger should be sampled no earlier than 48 hours following installation
3. Probes installed using rotosonic or air rotary methods should be sampled no earlier than 2 weeks following installation

6.3. SOIL GAS SAMPLE COLLECTION

6.3.1. Planning and Preparation

Rainfall, irrigation, fine-grained sediments, or drilling conditions may affect the ability to collect soil gas samples. Sampling should not be conducted during or within five days of a significant rain event (i.e., ½-inch or greater) or onsite watering (DTSC, 2009). If no-flow or low-flow conditions occur due to known or suspected water infiltration, then sampling should be terminated. Moisture should NOT be allowed to enter the Summa canister at any time.

Extensive purging or use of large volume sample containers, such as 6-liter Summa canisters, for near-surface sample collection (< five feet below ground surface) should be avoided to reduce the potential for sample breakthrough from the surface. To reduce ambient air intrusion, lower flow rates (less than or equal to 50 milliliters per minute [mL/min] or lower vacuum rates (<10 inches of water) can be used (DTSC, 2003).

6.3.2. Purge Volume Test

After the vapor probes have been installed, a purge volume test should be performed to determine the optimum purge volume. The purge volume test is conducted 1) to ensure stagnant or ambient air is removed from the sampling system and 2) to ensure samples collected are representative of subsurface conditions. Several individual purge tests are conducted by extracting different volumes and analyzing each sample for chemicals of concern (COC). The volume that yields the highest concentration of the risk-driving COC will be used for the sampling program.

Test locations should be selected as close as possible to known or suspected contaminant sources and in an area where soil gas concentrations are anticipated to be higher based on lithology (e.g., coarse-grained sediments).

The purge volume (i.e., dead space volume) can be estimated by the summation of, 1) the internal volume of the tubing used, and 2) the annular space around the probe tip. The volume of Summa canisters, syringe, and Tedlar bags are not included in the calculation. To ensure sufficient purging in conducted prior to sample collection, step purge tests of 1, 3, and 10 purge volumes should be conducted prior to sampling (DTSC, 2009). Step purge tests and purging should be conducted at the same rate that sampling is to be conducted. In addition, all purge test data should be recorded to support the purge volume selected (i.e., calculated purge volume, and rate and duration of each purge step). Purge tests can be performed using qualitative methods (e.g., Tedlar bags and PID/FID screening instruments), or quantitative methods (Summa canisters and laboratory analyses). The selected method should be based on project-specific data quality objectives. The procedures for purging and sampling using Summa canisters are presented in Section 6.3.3.

The appropriate purge volume should be selected based on the analytical results of the samples. The purge volume selected should be the one which resulted in the highest concentration for the COCs detected during the step purge tests. The purge volume should be chosen for the COC of greatest concern. If there are no COCs detected in any of the samples collected following purge volume tests, or concentrations are relatively similar, a default of 3 purge volumes should be used for sampling the site (DTSC, 2003).

If site lithology is widely variable or different soils are encountered, additional purge volume tests may be warranted. Based on the results of additional testing, different purge volumes may be applied for different soil types during sampling.

6.3.3. Summa Canister Sampling

There are two types of sampling that involve Summa canisters: grab and integrated. Grab samples are taken over a short period of time (i.e., 1 to 5 minutes) and integrated samples are taken over an extended period of time (i.e., 0.5 to 24 hours). In both modes of sampling, the canister vacuum is used to draw the sample into the canister. Procedures for assembling and testing the various Summa canister collection systems are presented in this section.

6.3.3.1 Equipment Inspection and Testing

Prior to mobilizing to the field, the Summa canister system should be inspected, connected, and tested to verify all components are operating as intended. The following checks should be performed:

1) Verify that all required equipment has been received (at a minimum, the Summa canisters, filter, vacuum gauges, flow controller, chain-of-custody, hand tools, fittings and leak test equipment, as needed)

4. Verify that all Summa canisters include certification tags

5. Verify the gauges are working properly

6. Verify the initial vacuum of each Summa canister and record the reading (initial vacuum should be greater than 25 inches of mercury [in. Hg]; if less than 25 in. Hg, canister should not be used for sample collection). The following step-by-step procedures should be employed.
    a. Confirm the valve is closed (knob should be tightened clockwise)
    b. Remove the brass cap
    c. Attach the gauge
    d. Attach the brass cap to the side of the gauge tee fitting (if not already present) to close the train
    e. Open and close the valve quickly (1-3 seconds)
    f. Read the vacuum on the gauge & record on the chain-of-custody and sample tag
    g. Verify the canister valve is closed and remove the gauge
    h. Replace the brass cap

6.3.3.2 Grab Sampling with Canisters

1) Grab sampling procedures described in this section are for typical ambient air sample collection.
2) Confirm the valve is closed (knob should be tightened clockwise)
3) Remove the brass cap
4) Attach the particulate filter to canister
5) If collecting from a sampling probe, attach canister and filter to the sampling probe
6) Open the valve half turn
7) After the designated time has elapsed for the canister to fill (or the gauge reads 5 in. Hg) close valve by hand, tightening knob clockwise
8) Verify and record the final vacuum of the canister (follow above steps for recording initial vacuum)
9) Replace the brass cap
10) Label the sample and record the sample information on chain-of-custody

6.3.3.3 Integrated Sampling with Canisters

1) Confirm the valve on the canister is closed (knob should be tightened clockwise)
2) Remove the brass cap
3) Attach the flow controller to the canister

4) Place the brass cap at the end of the flow controller to create an airtight train and quickly open and close the canister valve in order to check for leaks. If the needle on the gauge drops, the train is not airtight. If this occurs, try refitting the connections and tightening them until the needle holds steady

5) If collecting from a sampling probe, attach sample train to the sampling probe

6) Open the canister valve by a half turn

7) Monitor the integrated sampling progress periodically. The volume of air sampled is a linear function of the canister volume. For example, halfway (4 hours) into an 8-hour sampling interval, the canister should be half filled and the gauge should read approximately 17 in. Hg. More vacuum than 17 in. Hg indicates that the canister is filling too slowly; less than 17 in. Hg indicates the canister is filling too quickly. If the canister is filling too slowly, a valid sample can still be collected as long as the final vacuum is not greater than 5 in Hg. If the final vacuum is greater than 5 in Hg, the sample dilution may be greater than normal, resulting in elevated reporting limits. If the canister is filling too quickly because of a leak or incorrect flow controller setting, corrective action such as ensuring all connections are tight can be taken.

8) After the designated time has elapsed for the canister to fill (or the gauge reads 5 in. Hg) close valve by hand, tightening knob clockwise

9) Verify and record the final vacuum of the canister (i.e., read the built-in gauge)

10) Remove the sample train from the probe, if applicable

11) Remove the flow controller and replace the brass cap

12) Label the sample and record sample information on chain-of-custody

6.3.3.4 Integrated Sampling Using Sampling Manifold

A sample manifold is used for integrated sampling to increase quality control, allow for automatic leak-check, and minimize the potential for leaks due to multiple connections in the sample train. When the purge canister is opened and closed, it creates a vacuum within the canister lines and fittings. If this vacuum is maintained (no visible change on the gauges), the train is considered leak-free. There is only one connection – the probe tubing to the sample train – thereby reducing the chance for leaks. The manifold's in-line gauges used with a purge canister enables the sampler to determine the appropriate purge volume (based on purge volume test results; see Section 5). The purge volume can be monitored by the decrease in vacuum which is proportional to the volume purged through the lines. The flow rate should be limited to between 100 and 200 milliliters per minute (mL/min) to limit stripping, prevent ambient air from diluting soil gas samples, and to reduce the variability of purging rates (DTSC, 2003). A sampling manifold has a built-in flow controller between two gauges that is calibrated at a certain flow rate (obtained from analytical laboratory).

If a sampling manifold is requested from the laboratory for integrated sampling, each individual Summa canister is certified from the analytical laboratory for use with a corresponding sampling manifold as a train (certified together and should be used together). This manifold should only be used with the corresponding canister number. Once used, the sampling manifold should be returned with the Summa canister to the analytical laboratory for decontamination and re-certification.

Sample Manifold Equipment

The sampling manifold described here is a design from Air Toxics, Ltd (Air Toxics Ltd, 1989). It is recommended that sampling manifolds be obtained from the laboratory because they can be certified and cleaned between uses (to prevent cross contamination). The sampling manifold connects in series a particulate filter, vacuum gauges, a flow controller, another vacuum gauge, the purge Summa canister (not certified) and manifold valve, and the sample Summa canister. The manifold is connected to the soil vapor probe on the filter end. The first gauge, located prior to the flow restrictor, is a vacuum gauge that informs the sampler if sufficient vapor is being collected from the soil or if the substrate is too compacted. The gauge is not a flow meter, so it should read zero if there is sufficient flow from the soil (if there is a reading of vacuum, then flow is being restricted by the subsurface). The second gauge, in line after the flow controller and prior to the purge canister, is a vacuum gauge that indicates whether or not the canister is filling properly at the expected rate. The manifold allows for a duplicate sample to be collected by attaching a “duplicate-T” fitting which provides two connections for Summa canisters. The manifold also allows for a duplicate sample to be collected, if required, by replacing the purge canister with another certified Summa canister.

Manifold Leak Check Test

Prior to sampling, the sample manifold should be checked for leaks using the process described below.

1) Confirm the valve is closed (knob should be tightened clockwise)
2) Remove the brass caps from both the sample canister and the purge canister (unless using certified media, there is no difference between the two)
3) Attach the manifold to the canisters
4) Confirm that there is a brass cap secured at the inlet of the manifold creating an airtight train. Make sure the manifold valve above the purge canister is open, and quickly open and close the purge canister valve in order to check for leaks. If the needle on the gauge drops, your train is not airtight. In this case, try refitting the connections and tightening them until the needle holds steady. If the gauge reading still falls, the manifold and corresponding canister should not be used. Both gauges should equalize and remain constant for approximately 10 minutes.

6.3.3.5. Purging

The procedures described below are for typical soil gas sampling applications.

1) Once the sample train is airtight, remove the brass cap from the manifold inlet, connect the tubing from the sample probe using a compression fitting and open the purge canister valve a half turn

2) Monitor the purging progress periodically. It is important to note that because a flow controller is used, the purge rate will be equal to the flow restrictor's rate

3) Once the desired purge volume is met, close both the manifold valve and the purge canister valve by hand tightening the knobs clockwise

4) If sampling at multiple locations, the purge canister can be disconnected from the manifold and used to begin purging the next sample location without compromising the sample train. It is important to note that the vacuum within the purge canister should be closely monitored so that if used at multiple locations, the canister being used is not full or without vacuum (<5 in. Hg)

6.3.3.6. Sample Collection Using a Manifold

1) Following purging, the probe is ready to be sampled. Open the sample canister valve and monitor sampling progress periodically. When the sample canister vacuum is < 5 in. Hg, the sampling is complete

2) When sampling is complete, close the valve and replace the brass cap on the canister

3) Record the final vacuum of canister on chain-of-custody and on sample tag

4) Do not reuse the manifold

6.3.4. Tracer Compound Leak test

A leak test is necessary to ensure that ambient air does not dilute the sample and show results which underestimate the actual site concentrations or contaminate the sample with external contaminants. A known compound is introduced around the assembly fittings of the manifold, Summa canisters, probe connection, and surface seals of wells. The Summa canisters are then analyzed for the introduced compound at the laboratory to determine if there were leaks in the sample train. The tracer compound MUST NOT be a known or suspected site contaminant. Tracer compounds can be either liquid (i.e., hexane, pentane, n-propanol) or gas (i.e., helium, isobutene, propane, and butane). Gaseous compounds must be used along with appropriate shrouding or tenting. Helium is becoming a preferred tracer for leak tests since it can be both qualitatively and quantitatively analyzed (DTSC, 2003).

6.3.4.1. Qualitative and Quantitative Analysis

Qualitative analysis of the leak is done by (the laboratory analysis) quantifying the detection limit of the target analyte(s). If the concentration of leak compound is 10 times the detection limit for the target analyte(s), this indicates the need for corrective action. Quantitative analysis is performed by use of a shroud with a gaseous tracer compound to determine the percent of ambient air leak into a collection vessel. If the leak is more than 10 percent, the source of the leak should be identified and corrected. If this is not possible, the sampling point/probe should be abandoned or decommissioned.

6.3.4.2. Helium Leak Testing

Helium is a recommended tracer compound because it can be performed both in the field and in the laboratory, it is considered reasonably quantitative, and it is useful where some leaks may be unavoidable (i.e., low permeability soil or shallow depth probes). Small leaks less than or equal to 5 percent are allowable (DTSC, 2009). Leak tests should be performed simultaneously with sample collection. The process described below applies to integrated sampling with Summa canisters and should be performed after purging is complete and once the valve has been opened to the sample canister.

1) A shroud should be used over the surface seal of the well, the sample canister and manifold. It should encompass all these components completely
2) Add tracer compound (Helium) to shroud or other connections (it is possible to use a tracer compound [Helium] field meter to determine the presence of the tracer in the shroud)
3) Monitor presence of tracer (as needed), and record
4) Remove shroud once sampling is complete and request the tracer compound analysis in addition to COC analyses on the chain-of-custody

6.3.5. Notes

Important notes to be considered are:

- Do not use canister to collect explosive substances, radiological or biological agents, corrosives, extremely toxic substances or other hazardous materials. It is illegal to ship such substances.
- Always use a filter when sampling.
- NEVER allow liquids (including water) or corrosive vapors to enter canisters.
- Do not over tighten valves.
- Replace brass caps after dismantling canisters from manifolds.

6.3.6. Sample Handling

Exposure to light and changes in temperature and pressure will accelerate sample degradation. To protect sample integrity the soil gas sample containers should not be chilled and shipping by air should be avoided.

7. Attachments

- Attachment 1, Soil Gas Probe Emplacement Methods.

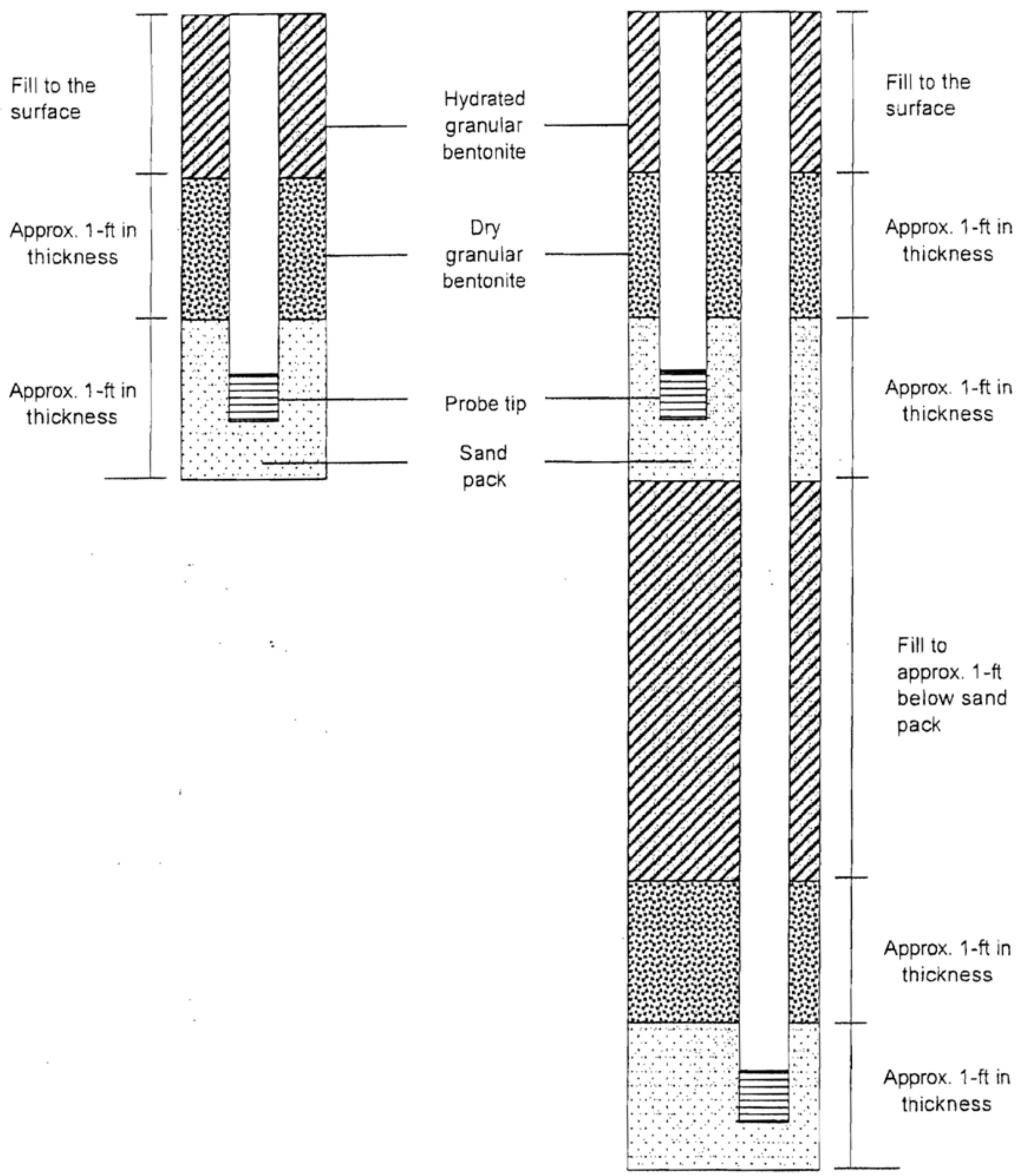
8. Field Forms

- Soil Gas Sampling Form

Attachment 1
Soil Gas Probe Emplacement Methods

Figure 1 – Permanent/Semi-permanent Gas Probe Construction Diagram

Figure 2 – Multi-depth Gas Probe Construction Diagram



Soil Vapor Sample Collection Log

Project Number: ____________________
Date: ____________________
Client Name: ____________________
Location: ____________________
Sampler(s): ____________________

Weather: ____________________
Barometric Pressure: ____________________
Ambient Temperature: ____________________
Arrival Time: ____________________
Departure Time: ____________________

Sample Location ID : ____________________

Sampler Signature: ____________________

Sample ID				
Sample Probe Depth (ft)				
Length of tubing (ft)				
Inside Diamiter of Tubing (in)				
Analysis Method				
Number of Volumes to Purge*				
Total Purge Volume (ml)**				
Purge Time (mins)***				
Canister Size (L)				
Flow Rate (ml/min)				
Canister Number				
Certification Number				
Initial Sample Canister Vacuum (in Hg)				
Manifold Leak Test Pass (Y/N)				
Shroud Helium Concentration (ppm)				
Leak Check Helium Concentration (ppm)				
Sample Collection Start Time				
Vacuum Reading for Gas Probe (in Hg)				
Sample Collection Stop Time				
Final Sample Canister Vacuum (in Hg)				
Duplicate or QC sample (Y/N)				

*Number of probe volumes to purge will be previously determined for each soil type during the purge step test.

** Multiply **tubing length** by **conversion constant (ml/ft)** and **number of probe volumes to purge**.

*** Divide **total purge volume** by the **flow rate**

Conversion constant (ml/ft) for ***1/8 inch inside diameter*** *tubing (standard for soil gas probes) =* ***2.41 (ml/ft).***

Notes : ____________________

ERRG

Title: **Soil Sampling from Excavator Bucket**

Document Number: **FS-051**

Revision Number: **0**

Reason for Revision:

Reviewed: ______________________ 9/9/2009
QC Manager Date

Approved: ______________________ 9/9/2009
Program Manager Date

1. Purpose

The purpose of this standard operating procedure (SOP) is to provide methods and procedures for collecting soil samples from an excavator bucket. Soil samplers can be used to collect samples from excavator buckets when an intact depth-specific sample is required.

2. Scope

This SOP is applicable to all ERRG projects where soil samples will be collected from an excavator bucket. Standard sampling containers (e.g., brass or stainless steel sleeves for samples to be analyzed for non-volatile constituents or EnCore® samplers for samples to be analyzed for volatile organic compounds) are used to collect the sample from the excavator bucket. This SOP is not applicable to drilling or direct-push methods.

3. References

- U.S. Environmental Protection Agency, 2000. "Standard Operating Procedures, Soil Sampling, SOP 2012." Environmental Response Team. February 18. Available Online at: <http://www.ert.org/mainContent.asp?section=Products&subsection=List>.
- U.S. Army Corps of Engineers, 2001. "Requirements for the Preparation of Sampling and Analysis Plans, EM200-1-3." Washington, DC. February.

4. Definitions

Brass or Stainless Steel Sleeve—A sample collection device consisting of a hollow metallic tube, with plastic caps and silicon or Teflon tape. The sleeve fills with material as the sampler is forced downward, allowing for an undisturbed core to be collected.

EnCore® Sampler—A form of Sealed-Cap VOC Sampler designed and marketed by En Novative Technologies, Inc., of Green Bay, Wisconsin. The cartridges come in two sizes for sample volumes of approximately 5 or 25 grams.

5. Responsibilities

5.1. PROCEDURE RESPONSIBILITY

The Field Sampling Lead is responsible for maintenance, management, and revision of this SOP. Questions, comments, or suggestions on this SOP should be sent to the Field Sampling Lead.

5.2. PROJECT RESPONSIBILITY

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6. Procedure

Safety Note: *Use eye contact and hand signals to maintain awareness and communication between heavy equipment operator and the sampler and others on foot. Sampler and others on foot should stand at a distance from heavy equipment until the machine is no longer moving and a sample is ready to be collected from the excavator bucket.*

The sampling procedure is as follows:

1. Decontaminate the excavator bucket.
2. Instruct heavy equipment operator to scoop material at the desired depth for sample collection with the excavator bucket. Use a measuring tape to measure the distance from the sampled depth (center of the excavator bucket) to the ground surface to ensure the desired depth is met.
3. Assemble the sampler. If using a brass or stainless steel sleeve, cover one end of the sleeve with silicon or Teflon tape and capping with a plastic end cap to close the end. If using an EnCore® sampler, follow instructions in SOP FS-016 (SOP for Sampling VOCs using an EnCore® Sampler).
4. Wearing gloves, gently remove the outer layer of soil (slough) and expose the undisturbed sample material in the middle of the excavator scoop.
5. Don a pair of clean sample gloves.
6. Place the open end of the assembled sampler directly on the undisturbed sample material inside the excavator bucket and, while holding it vertical, push straight down into the soil.
7. Continue to force the sampler downward to ensure that the entire sampler is filled with material.
8. Extract the sampler and cap immediately. If using an EnCore® sampler, follow SOP FS-016. If using a brass or stainless steel sleeve, place silicon or Teflon tape over the uncapped end of the steel sleeve and cap with a plastic end cap to close the end.

7. Attachments

None.

Title: **Sampling for VOCs in Soil using a Sealed-Cap (Encore®) Sampler**

Document Number: **FS-016**

Revision Number: **0**

Reason for Revision:

Reviewed: ______________________ 9/9/2009

QC Manager Date

Approved: ______________________ 9/9/2009

Program Manager Date

1. Purpose

The purpose of this standard operating procedure (SOP) is to provide general information about the procedures for using the Disposable EnCore® Sampler or other similar sealed-cap soil samplers. These samplers are used to obtain and ship soil and clay samples for volatile organic compound (VOC) analysis, including gasoline-range organics (GRO), in accordance with U.S. Environmental Protection Agency (EPA) SW-846 Method 5035 and other related protocols.

2. Scope

This SOP applies to all instances where soils require sampling and shipment for VOC analysis using no headspace methods, including samples collected from drilling cores. This SOP should not be used if collecting samples for pre-weighed vial VOC methods. This SOP and these types of samplers are not applicable to non-elastic soils and noncompactable materials, such as loose sand, rocky soils, and gravel. Such materials should be sampled using alternative methods.

3. References

- U.S. Environmental Protection Agency, 1996. "Closed-System Purge and Trap and Extraction for Volatile Organics in Soil and Waste Samples." In: *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, Third Edition.* Available Online at: <http://www.epa.gov/epawaste/hazard/testmethods/sw846/online/index.htm>.
- En Novative Technologies, Inc., "Disposable EnCore® Sampler Sampling Procedures - Using the EnCore® T-Handle," guide supplied with each case of samplers.

4. Definitions

Sealed-Cap VOC Sampler—A single-use volumetric sampling system designed to collect, store, and deliver soil samples for VOC methods that require no headspace.

EnCore® Sampler—A form of Sealed-Cap VOC Sampler designed and marketed by En Novative Technologies, Inc., of Green Bay, Wisconsin. The cartridges come in two sizes for sample volumes of approximately 5 or 25 grams.

EnCore® T-Handle—The specially machined holder for the EnCore® sampler sold separately by En Novative Technologies, Inc. The T-Handle provides the leverage needed to push the sampler into the soil and should be used along with the sampler. In cases where a T-Handle is not available, it is possible (though not recommended) to grip the sampler by the sides, away from its sealing surfaces, with a pair of pliers or similar implement and push it into the soil.

5. Responsibilities

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6. Procedure

For each sample location collected and for each applicable field or laboratory quality control (QC) sample, a total of three samples will need to be obtained, as follows:

1. Open the sealed bag containing the sampler and, if using an EnCore®, push the plunger down until the small O-ring rests against the tabs.
2. If using an EnCore®, the locking lever on the T-Handle must be depressed as the cartridge is inserted. Line up the slots on the cartridge with the locking pins in the T-Handle. Plunger end first, insert cartridge into T-Handle with locking tabs aligned and twist the cartridge clockwise locking it in place.
3. Prepare the surface by removing grass, sticks, and other matter to allow the sampler to penetrate the intended location.
   - For hard pan soils and clays or excavations, scrape away the top few inches of the material to expose virgin and penetrable soil and clay for sampling.
   - When sampling subsurface cores, split the core cover lengthwise or push the core from the coring tube to expose the core and sample from points along the core.

4. Insert the cartridge device into the material being sampled with a downward twisting motion until full. If using the EnCore® system, observe the appropriate hole in the T-Handle and continue to push the sampler into the material being sampled until the small O-ring on the plunger is visible in the viewing hole (5-gram bottom hole; 25 gram top hole).
5. Withdraw sampling device from medium and use a fresh tissue to wipe off excess material from the outside of the cartridge body and especially the O-rings. If soil is protruding from the tube, carefully slice it off even with the open end using a clean knife or spatula.
6. For the EnCore® system, while the cartridge is still on the T-Handle, turn the T-Handle until the cartridge is facing upward and place the cap over the cartridge with the locking arms aligned with the flat surfaces of the locking ridge. Then gently push the cap onto the cartridge with even pressure, and twist the cap maintaining downward pressure until the arms lock against the ridge. Non-EnCore® systems must be sealed according to the manufacturer's instructions.
7. Inspect the cap and seal making sure that the cap is seated over the cartridge squarely and evenly. For the EnCore® system, both arms must be locked over the ridge or an imperfect seal will result, compromising the data.
8. Remove the capped sampler from its holder.
9. For the EnCore® system, lock the plunger by rotating the plunger rod counterclockwise until the wings rest against the tabs.
10. Complete and attach the label and seal the cartridge in the provided sampler bag.
11. Repeat steps 1 through 10 for the other two cartridges needed for the sample location, collecting each cartridge from undisturbed material as close as possible to the original location.
12. Place all three cartridges in the same bag and then label the outside of the bag per the project requirements.
13. Place the labeled bag into a cooler with the project-required coolant (ice or dry ice).
14. Complete all required documentation and ship to the laboratory per the project plans

7. Attachments

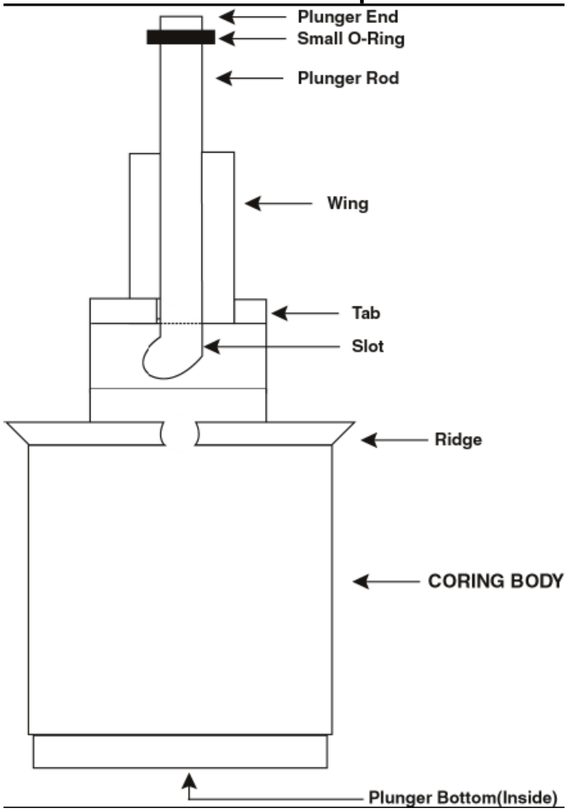
- Attachment 1 – EnCore® Sampler Figures, from En Novative Technologies, Inc. website at: <http://www.ennovativetech.com/sampling.asp>.

8. Forms

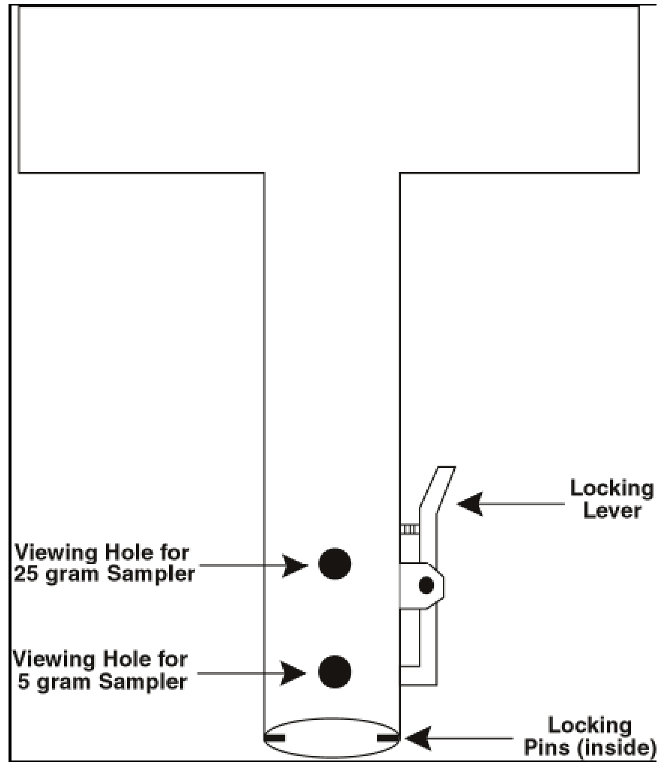
None.

ATTACHMENT 1
ENCORE® SAMPLER FIGURES

ENCORE® Sampler



T-Handle



Title: **Decontamination of Contact Sampling Equipment**

Document Number: **FS-010**

Revision Number: **0**

Reason for Revision:

Reviewed: ______________________ 9/9/2009
QC Manager Date

Approved: ______________________ 9/9/2009
Program Manager Date

ERRG

Decontamination of Contact Sampling Equipment

1. Purpose

This standard operating procedure (SOP) defines the Engineering/Remediation Resources Group, Inc. (ERRG) standard that must be implemented for decontamination of contact sampling equipment. Contact sampling equipment is equipment that comes in direct contact with the sample or portion of sample that will undergo chemical analyses or physical testing. This SOP is intended to provide minimum guidelines and general procedures for decontaminating contact sampling equipment used during field sampling activities. The benefits of its use include the following:

- Minimizing the spread of contaminants within a study area and from site to site
- Reducing the potential for worker exposure by means of contact with contaminated sampling equipment
- Improving data quality and reliability

2. Scope

This SOP applies to all instances where nondisposable direct contact sampling equipment is used for sample collection. This SOP is not intended to address decontamination of peristaltic or other sampling pumps and tubing. The steps outlined in this SOP must be executed between each distinct sample data point.

3. References

- U.S. Environmental Protection Agency (EPA), Region 4, 2001. "Environmental Investigations Standard Operating Procedures and Quality Assurance Manual." 980 College Station Road, Athens, Georgia. November.
- U.S. Army Corps of Engineers, 2001. "Requirements for the Preparation of Sampling and Analysis Plans, EM200-1-3." Washington, DC. February.

4. Definitions

Soap—A standard brand of phosphate-free laboratory detergent, such as Liquinox®.

Organic Desorbing Agent—A solvent used for removing organic compounds. The specific solvent would depend upon the type of organic compound to be removed.

Inorganic Desorbing Agent—An acid solution for use in removing trace metal compounds. The specific acid solution would depend upon the type of inorganic compound to be removed.

Tap water—Water obtained from any municipal water treatment system. An untreated potable water supply can be used as a substitute for tap water if the water does not contain the constituents of concern.

Analyte-free water (deionized water)—Water that has been treated by passing through a standard deionizing resin column, and for organics either distillation or activated carbon units. At a minimum, the finished water should contain no detectable heavy metals or other inorganic compounds and no detectable organic compounds (i.e., at or above analytical detection limits). Analyte-free water obtained by other methods is acceptable, as long as it meets the above analytical criteria.

Other solvents may be substituted for a particular purpose if required. For example, removal of concentrated waste materials may require the use of either pesticide-grade hexane or petroleum ether. After the waste material is removed, the equipment must be subjected to the standard cleaning procedure. Because these solvents are not miscible with water, the equipment must be completely dry prior to use.

5. Responsibilities

5.1. PROCEDURE RESPONSIBILITY

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this SOP. Questions, comments, or suggestions on this SOP should be sent to the Field Sampling Discipline Lead.

5.2. PROJECT RESPONSIBILITY

ERRG employees performing this task, or any portion thereof, are responsible for meeting the requirements of this SOP. ERRG employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate SOPs. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (i.e., checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. Procedure

6.1. HEALTH AND SAFETY

Minimum health and safety procedures should be implemented based on the site-specific decontamination protocol that is designed. Health and safety procedures should consider the potential use of either dangerous solvents or corrosive liquids.

6.2. IMPLEMENTATION

A decontamination area should be established. A separate tub needs to be available for each of the first four steps. Each type of water and soap solution can be placed in hand-held sprayers made of an inert material. The analyte-free water needs to be placed in a container that will be free of any chemicals of concern. Special containers will be needed if solvents or acid solutions are used. For example, an acid solution cannot be placed in a sprayer that has any metal parts that will come in contact with the acid solution.

The minimum steps for decontamination are as follows:

1. Remove particulate matter and other surface debris using appropriate tools such as a brush or hand-held sprayer filled with tap water.
2. Scrub the surfaces of the contact sampling equipment using tap water and soap solution and a second brush made of inert material.
3. Rinse contact sampling equipment thoroughly with tap water.
4. Rinse contact sampling equipment thoroughly with analyte-free water (not necessary if sampling for disposal profiling purposes).
5. Place contact sampling equipment on a clean surface appropriate for the chemicals of concern and allow to air dry.

It is ERRG policy to containerize all decontamination fluids. This policy will be followed unless the client specifically directs an alternate procedure in writing.

The use of solvents and acid solutions will be dependent on the site-specific conditions. A site with a high probability of high concentrations of compounds or with waste material present will require additional decontamination procedures.

7. Attachments

None.

8. Forms

None.

Title: **Data Usability Review**

Document Number: **FS-011**

Revision Number: **0**

Reason for Revision:

Reviewed: ______________________ 9/9/2009
QC Manager Date

Approved: ______________________ 9/9/2009
Program Manager Date

ERRG

1. Purpose

The purpose of this standard operating procedure (SOP) is to establish the means by which all subcontracted environmental analytical data will be reviewed for completeness and usability based upon comparison to the project action and decision levels and data quality objectives (DQOs) before use in the intended decision-making processes.

2. Scope

This SOP applies to all subcontracted analytical data, including faxed or e-mail preliminary reports. By way of its requirements, this SOP prohibits verbal communication of analytical results and establishes minimum deliverable standards that must be provided for all subcontracted analytical data reports, including faxed or e-mailed preliminary reports. These minimum standards include the following:

- Sample Results
- Chain of Custody – unless already available to the reviewer
- Sample Receipt Documentation – unless already available to the reviewer
- Quality Control (QC) Summary – laboratory control blank, laboratory control spike, matrix spike, matrix spike duplicate, and post-digest spike
- Surrogate Summary (if applicable)
- Hold-time Compliance Summary – or signed certification that all requirements were met
- Initial and Continuing Calibration Information – or signed certification that it meets prescribed requirements
- Gas Chromatography (GC)/Matrix Spike (MS) Tuning Information (if applicable) – or signed certification that it meets prescribed requirements

This SOP should be performed only by or under the oversight of properly qualified individuals. Oversight may be accomplished through provision of a project-specific and well-defined checklist, training in its use, regular quality assurance (QA) checks, and real-time availability for issue resolution.

3. References

- U.S. Environmental Protection Agency (EPA), 2004. "National Functional Guidelines for Inorganic Data Review." OWSER 9240.1-45, EPA 540/R-04-004. October. Available Online at: <http://www.epa.gov/superfund/programs/clp/download/inorgfg10-08-04.pdf>.
- EPA, 1999. "National Functional Guidelines for Organic Data Review." EPA 540/R-99-008 (PB99-963506). October. Available Online at: <http://www.epa.gov/superfund/programs/clp/download/fgorg.pdf>.

- U.S. Department of Defense, 2002. "Department of Defense Quality Systems Manual for Environmental Laboratories, Final." June.
- U.S. Army Corps of Engineers, 2001. "Requirements for the Preparation of Sampling and Analysis Plans, EM-200-1-3." February.

4. Definitions

Data Usability Review (DUR)—The cursory review of an analytical data package for completeness and compliance with the ordered analysis, specified quality, and method- and project-specific protocols before the data are used as input to a particular project decision-making process. The DUR process identifies any potential data quality issues and informs the data users of the effect on the data usability.

Data Quality Objectives (DQOs)—The empirical statements and quantitative measures necessary for a given set of measurements to be usable in the planned decision.

Data Quality Indicators—Field and laboratory measures for which compliance with specified requirements or limits can be construed to support attainment of the DQOs in a given data set.

Analytical Data Package—The manner in which analytical results are provided from subcontractor laboratories. Analytical data packages can be received via fax, e-mail, or postal mail.

QC Summary—A summary table of laboratory QC sample results.

Laboratory Control Blank (LCB)—Reagent water or clean solid matrix analyzed in the same manner as a sample to determine the target analyte concentration contribution due to contamination in the entire analytical system.

Laboratory Control Spike (LCS)—Reagent water or clean solid matrix spiked with a known concentration of target analytes and analyzed as a sample to determine the method accuracy of the analytical system.

Matrix Spike (MS)—A sample spiked with a known concentration of target analyte and analyzed along with the rest of the analytical batch. The percent recovery of the target analytes is used to determine the effect on accuracy due to the sample matrix.

Matrix Spike Duplicate (MSD)—A duplicate of the MS used to determine the analytical precision, expressed as relative percent difference (RPD) of the analytical system.

Surrogate Compound—In several organic methods, a compound similar in structure and chemical behavior to the target analytes, which is added to each sample and QC sample at a known concentration before the analysis begins. The surrogate recovery is used to approximate the recovery of the target compounds based upon the behavior of chemically similar analytes.

Post-digest Spike—In metals analyses, used to determine the possibility of chemical interferences and digestion deficiencies. If the normal QC results are unacceptable, a known concentration of the target analyte is added to the sample digestate. The recovery is then used to determine if reanalysis or data qualification is warranted.

Quality Control (QC) Acceptance Range—The limits that define QC results demonstrating compliant accuracy and precision.

Qualified Person—An individual capable through knowledge, education, formal training, and experience in the establishment and verification of analytical DQOs. The qualified person is usually a chemist or environmental professional with several years of environmental analytical experience.

Trip Blank—In analysis of volatile organic compounds, a container of reagent grade water that is included in the sample cooler and analyzed by the laboratory to determine if cross-contamination may have occurred in shipping.

Ambient or Field Blank—Reagent grade water containerized during sample collection activities and analyzed at the laboratory. The results are used to determine if sample results may be biased by site environmental factors.

Equipment Blank—Final rinsate collected during decontamination of sample equipment and analyzed by the laboratory. The results indicate the effectiveness of the decontamination procedure.

Field Duplicate—An additional sample aliquot or, in some cases, a collocated sample that is collected and analyzed. The results are compared with results of the original samples as an indication of the overall precision of the entire sampling and analytical process.

5. Responsibilities

5.1. PROCEDURE RESPONSIBILITY

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this SOP. Questions, comments, or suggestions on this SOP should be sent to the Field Sampling Discipline Lead.

5.2. PROJECT RESPONSIBILITY

ERRG employees performing this task, or any portion thereof, are responsible for meeting the requirements of this SOP. ERRG employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate SOPs. Project participants are responsible for documenting information in sufficient detail to provide

objective documentation (i.e., checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. Procedure

6.1. FIRST-LEVEL REVIEW OF THE DATA PACKAGE

Verify that the package contains all of the required elements listed in Section 2. If any items are missing, contact the laboratory immediately and correct the situation.

Compare the reported results to the chain-of-custody request, and verify that all expected samples and analyses results were reported. If results are missing, contact the laboratory and correct the situation. If the "missing" data are not available yet, perform partial review of the data provided and hold the package for follow-up once the nonreported results are provided.

6.2. SECOND-LEVEL REVIEW

Consult the project chemical quality plan (e.g., sampling and analysis plan, quality assurance project plan, etc.) for information concerning sample types and analysis requirements.

Compare the reported analytes, methods, and detection limits to those in the project plan for the specific analyses. Be sure to account for indicated and reasonable increased reporting limits due to dilutions or sample effects. Address any discrepancies with the laboratory directly.

Compare the results with project action-levels, and circle or otherwise mark all results above the limits.

6.3. QC LEVEL REVIEW

Consult the project data usability review checklists and the project chemical quality plan and evaluate all provided QC results against project acceptance limits. Mark or flag any results that are outside of the project limits and note on the applicable checklist (if using one). Also evaluate any field QC results such as duplicates and trip blanks against requirements and note any issues.

6.4. USABILITY REVIEW

If all QC results for all samples are within the acceptance ranges, complete the appropriate section of the checklist and then date and sign the completed checklist.

If all QC is acceptable and you are not using a checklist, you must indicate data usability directly on the data package itself or on a separate cover sheet. To do this, date and initial the QC summary pages and write "QC acceptable, data OK for use" on the cover sheet or QC summary page.

If any QC is noncompliant, review its impact to use as project data by referencing the QC Results Impact Table attached to this SOP and consult with the qualified person to determine final acceptability. Note on the data report itself or checklist all discrepancies and the reasons for data acceptance, qualification, or rejection. If a qualified person has made the decision, this should also be noted.

If any of the data are determined to be unusable, immediately notify the Project Manager and project site personnel.

6.5. REPORTING OF USABILITY REVIEW RESULTS

Project personnel must be provided either a spreadsheet summary of the results with an attached, signed, and dated Statement of Usability, or the complete data package with the project-specific data usability review documentation. At **no time** are results to be communicated verbally.

7. Attachments

- Attachment 1 – Project QC Impact Table

8. Forms

None.

ATTACHMENT 1
QC RESULTS IMPACT TABLE

QC Data Discrepancy	Result Non-detect	Result >10% Below Action-level	Result Within 10% of or Above Action-level	Result Greater than 10% Above Action-level
DISPOSAL				
Trip Blank Contaminated	No effect	No effect	No effect	No effect
LCB Contaminated	No effect on data	No effect on data	No effect unless contamination is >10% of action-level→reject	No effect unless contamination is =/> the difference between result and action-level
LCS Low Recovery	If MS/MSD are acceptable or Surrogates are acceptable and the RL is at most 20% of action-level→Data accepted	If MS/MSD are acceptable or Surrogates are acceptable→Data accepted Otherwise, flag and qualify that results may in fact be greater than action-level	If MS/MSD are acceptable or Surrogates are acceptable and LCS is within 10% of acceptance limit and result is above action-level→Data accepted Otherwise, flag and qualify result as suspected to be above action-level	No effect on data
LCS High Recovery	No effect on data	No effect on data	If MS/MSD are acceptable or Surrogates are acceptable evaluate potential bias in QC and accept data	No effect on data
Matrix Spike Low %R	If MSD and LCS acceptable and Surrogates or Post-spike within range Data is accepted with precision qualifier	If MSD and LCS acceptable and Surrogates or Post-spike within range Data is accepted with precision qualifier	No effect on data	No effect on data
Matrix Spike High %R	No effect on data	No effect on data	No effect on data	No effect on data
MS/MSD RPD High	No effect on data	No effect on data	No effect on data	No effect on data
Surrogate %R Low	If surrogate %R values are at least 70% of acceptance limit, Data is acceptable	If surrogate %R values are at least 70% of acceptance limit, Data is acceptable	No effect on data	No effect on data
Surrogate %R High	No effect on data	No effect on data	If surrogate %R values are within 30% of acceptance limit→Data is acceptable	No effect on data

Data Usability Review

QC Data Discrepancy	Result Non-detect	Result >10% Below Action-level	Result Within 10% of or Above Action-level	Result Greater than 10% Above Action-level
REMEDIATION or TREATMENT MONITORING				
Trip Blank Contaminated	No effect	No effect	If TB is greater than 10% of action-level or result→reject data	No effect
Duplicate Precision outside limits	No effect unless Duplicate is either above or within 50% of action-level - in this case qualify sample data and report with Duplicate result as "highest probable value"	No effect unless Duplicate is either above or within 30% of action-level - in this case qualify result as "assumed above action-level"	If Duplicate is either above or within 20% of action-level→qualify result as "assumed above action-level"	No effect-report result even if Duplicate is below action-level
LCB Contaminated	No effect on data	No effect on data	If LCB is greater than 10% of action-level or sample result→Data is unacceptable	No effect on data
LCS Low Recovery	If MS/MSD are acceptable or Surrogates are acceptable→Data accepted	If MS/MSD are acceptable or Surrogates are acceptable→Data accepted	If MS/MSD are acceptable or Surrogates are acceptable→Data accepted	No effect on data
LCS High Recovery	No effect on data	No effect on data	If MS/MSD are acceptable or Surrogates are acceptable evaluate for bias→Data accepted	No effect on data
Matrix Spike Low %R	If %R>50 and LCS acceptable-Data accepted	If %R>50 and LCS acceptable-Data accepted	If %R>50 LCS acceptable→Data accepted (evaluate potential low bias in results below action-level)	No effect
Matrix Spike High %R	No effect on data	No effect on data	If MSD and LCS acceptable and Surrogates or Post-spike within range→Data is accepted with precision qualifier	No effect on data
MS/MSD RPD High	No effect on data unless perceived native concentration in MS or MSD result would be above action-level. In this case, reject data as highly suspect and advise review of sampling and lab sub-sampling procedures	No effect on data unless perceived MS or MSD native concentration would be above action-level. In this case, qualify results as potentially above action-level	If the perceived native result of either the MS or MSD is greater than 110% of action-level→qualify data as being above action-level	No effect on data
Surrogate %R Low	1) If confined to one Surrogate in a fraction, Data is acceptable 2) If surrogate %R values are at least 80% of acceptance limits, Data is acceptable	1) If confined to one Surrogate in a fraction, Data is acceptable 2) If surrogate %R values are at least 80% of acceptance limits, Data is acceptable	No effect on data	No effect on data
Surrogate %R High	No effect on data	No effect on data	If Surrogate %R is greater than 120% of acceptance limit, Data is unacceptable	No effect on data

QC Data Discrepancy	Result Non-detect	Result >10% Below Action-level	Result Within 10% of or Above Action-level	Result Greater than 10% Above Action-level
VERIFICATION or CLOSURE ANALYSIS				
LCB Contaminated	No effect on data Comment LCB contamination	No effect on data Comment LCB contamination	If LCB is greater than 10% of action-level or sample result, Data is unacceptable	If LCB is greater than 10% of action-level or sample result, Data is unacceptable
LCS Low Recovery	If MS/MSD are acceptable or Surrogates are acceptable→Data accepted	If MS/MSD are acceptable or Surrogates are acceptable→Data accepted	If MS/MSD are acceptable or Surrogates are acceptable→Data accepted	If MS/MSD are acceptable or Surrogates are acceptable→Data accepted
LCS High Recovery	No effect on data	No effect on data	If MS/MSD are acceptable or Surrogates are acceptable→Data accepted (evaluate potential bias in reported result)	If MS/MSD are acceptable or Surrogates are acceptable→Data accepted
Matrix Spike Low %R	If MSD and LCS acceptable and Surrogates or Post-spike within range, Data is accepted with precision qualifier	If MSD and LCS acceptable and Surrogates or Post-spike within range, Data is accepted with precision qualifier	If MSD and LCS acceptable and Surrogates or Post-spike within range, Data is accepted with precision qualifier	If MSD and LCS acceptable and Surrogates or Post-spike within range, Data is accepted with precision qualifier
Matrix Spike High %R	If MSD and LCS acceptable and Surrogates or Post-spike within range, Data is accepted with precision qualifier	If MSD and LCS acceptable and Surrogates or Post-spike within range, Data is accepted with precision qualifier	If MSD and LCS acceptable and Surrogates or Post-spike within range, Data is accepted with precision qualifier	If MSD and LCS acceptable and Surrogates or Post-spike within range, Data is accepted with precision qualifier
MS/MSD RPD High	No effect on data	If sample result is greater then 90% of action-level, Data is unacceptable	If RPD is greater than 110% of acceptance limit, Data is unacceptable	If RPD is greater than 110% of acceptance limit, Data is unacceptable
Surrogate %R Low	1) If confined to one Surrogate in a fraction, Data is acceptable 2) If surrogate %R values are at least 80% of acceptance limits, Data is acceptable	1) If confined to one Surrogate in a fraction, Data is acceptable 2) If surrogate %R values are at least 80% of acceptance limits, Data is acceptable	1) If confined to one Surrogate in a fraction, Data is acceptable 2) If surrogate %R values are at least 80% of acceptance limits, Data is acceptable	1) If confined to one Surrogate in a fraction, Data is acceptable 2) If surrogate %R values are at least 80% of acceptance limits, Data is acceptable
Surrogate %R High	1) If confined to one Surrogate in a fraction, Data is acceptable 2) If surrogate %R values are within 20% of acceptance limits, Data is acceptable	1) If confined to one Surrogate in a fraction, Data is acceptable 2) If surrogate %R values are within 20% of acceptance limits and other QC is within acceptance limits, Data is acceptable	If any Surrogate %R is greater than 110% of acceptance limit, Data is unacceptable	1) If confined to one Surrogate in a fraction, Data is acceptable 2) If surrogate %R values are within 20% of acceptance limits, Data is acceptable

Appendix B. Field Forms

DAILY FIELD TRACKING LOG

Prepared by: ______________________ Client: ______________________

Day: ______________________ Date: ______________________

Project Name: ______________________ Project No.: ______________________

Description of Work: ______________________

LABOR

Name	Occupation	Time Worked		Straight Time			Overtime			Total
		Start	Finish	Hours	Rate	Amount	Hours	Rate	Amount	Amount
									Subtotal	

EQUIPMENT

Equipment No.	Description	Time Worked		Rental Rate			Overtime			Total
		Start	Finish	Hours	Rate	Amount	Hours	Rate	Amount	Amount
									Subtotal	

SUPPLIES AND MATERIALS

Supplier	Description	Quantity	Unit Rate	Amount	Overtime			Total
					Hours	Rate	Amount	Amount
							Subtotal	

SUBCONTRACTORS

Name	Description	Time Worked		Straight Time			Overtime			Total
		Start	Finish	Hours	Rate	Amount	Hours	Rate	Amount	Amount
									TOTAL	

DAILY FIELD ACTIVITY LOG

Prepared by: ______________________ Client: ______________

Day: ______________________ Date: ______________

Project Name: ______________________ Project No.: ______________

Weather: ______________________ Page: ______ of ______

Site Vistors: ______________________

Description of Field Activities:

Signed: ______________________ Date: ______________

HAZARDOUS MATERIALS MANAGEMENT RECORD SHEET

Prepared by: ______________________ Client: ______________________
Project Name: ______________________ Project No.: ______________________
Site Location: ______________________ Page: ________ of ________

Description of Waste	Quantity of Waste	Date Material Brought On-Site	Date Waste Generated	Date of Disposal	Disposal Method	Receiving Facility/ Transporter

WASTE DISPOSAL RECORD

Prepared by: ______________________ Client: ______________________

Project Name: ______________________ Project No.: ______________________

Site Location: ______________________ Page: ________ of ________

Ship Date	Daily Shipment #	Truck ID	Description	Manifest# or Shipping Paper#	Receiving Facility	DTSC #
total						Total

CONFIRMATION
SAMPLE RECORD

Prepared by: ______________________ Client: ______________________

Project Name: ______________________ Project No.: ______________________

Site Location: ______________________ Page: __________ of __________

Sample Date	Sample Location	Sample ID	Description eg.waste,rinse	Analysis	Sample Facility	COC #	Sampler

PHOTOGRAPH LOG

Prepared by: ______________________ Client: ______________________
Project Name: ______________________ Project No.: ______________________
Site Location: ______________________ Page: ________ of ________

Photo	Description

FIELD CHANGE JUSTIFICATION/WORK PLAN AMENDMENT

To:	**Date:**
From:	
Subject:	

This Field Change Justification documents X proposed modification to the soil compaction requirements associated with the soil work at X.

☑ *This Amendment **does not** constitute a Significant change per Southwest Division Environmental Work Instruction 2, requiring a revised Work Plan document.*

Reason

.

Approval:

____
Name

____
Title

Appendix C. Asbestos and Hazardous Building Materials Survey Summary

Appendix C
Asbestos and Hazardous Building Materials Survey Summary for Buildings 965 and 969
Former Department of Defense Housing Facility, Novato, California

Contract No.: N62473-09-D-2608
ERRG Project No.: 29-059

Submitted by:
Engineering/Remediation Resources Group, Inc.

Plan Preparer:

	9/18/09
Signature	Date
Anthony Broderick, CAC	Assistant Project Scientist Phone: (415) 359-8792

Table of Contents

SECTION 1. INTRODUCTION 1-1
1.1. Building 965 1-1
1.2. Building 969 1-1
SECTION 2. ASBESTOS RESULTS 2-1
2.1. Building 965 2-1
2.2. Building 969 2-1
SECTION 3. LEAD-BASED PAINT RESULTS 3-1
3.1. Building 965 3-1
3.2. Building 969 3-1
SECTION 4. OTHER HAZARDOUS MATERIALS 4-1
SECTION 5. IMMINENT HAZARDS 5-1
SECTION 6. SUMMARY AND RECOMMENDATIONS 6-1

List of Figures

Figure C-1. Asbestos-Containing Material Sample Locations
Figure C-2. Lead-Based Paint Sample Locations

List of Tables

Table C-1. All Asbestos Results for Building 965
Table C-2. Positive Asbestos Results for Building 969
Table C-3. All Asbestos Results for Building 969
Table C-4. Lead Results for Building 965
Table C-5. Positive Lead Results for Building 969

List of Appendices

Appendix C1. Laboratory Analysis Reports

Acronyms and Abbreviations

ACM	asbestos-containing material
ERRG	Engineering/Remediation Resources Group, Inc.
HUD	U.S. Department of Housing and Urban Development
HVAC	heating, ventilation, and air conditioning
LBP	lead-based paint
mg/kg	milligrams per kilogram
NESHAP	National Emission Standards for Hazardous Air Pollutants
PACM	presumed asbestos-containing material
PCB	polychlorinated biphenyl
PLM	polarized light microscopy
ppm	parts per million
TSI	thermal system insulation

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Section 1. Introduction

This report summarizes the observations and results of a pre-deconstruction survey for asbestos-containing material (ACM) and lead-based paint (LBP) at Buildings 965 and 969, former Department of Defense Housing Facility, Novato, California. The survey was conducted by Mr. Anthony Broderick, Certified Asbestos Consultant, of Engineering/Remediation Resources Group, Inc. (ERRG), in two phases. The first phase of sampling was conducted on June 12, 2009, and the second phase of sampling was conducted on September 2, 2009.

1.1. BUILDING 965

Building 965 is a single-story concrete structure with a slab-on-grade foundation and a tar and asphalt roof, comprising approximately 674 square feet. Interior finishes, such as finished walls and floors, were not present in Building 965. A heating, ventilation, and cooling (HVAC) system is located in the southeast corner of the building. Windows do not contain caulking or putty.

1.2. BUILDING 969

Building 969 is a single-story wood frame structure with a slab-on-grade foundation and asphalt roof shingles, comprising approximately 3,308 square feet. Interior finishes, such as a sheetrock ceiling and sheetrock or plaster walls, are present in Building 969. The floor does not have any finish. A boiler is located in the northern portion of the building. Windows contain caulking.

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Section 2. Asbestos Results

2.1. BUILDING 965

ERRG's inspector collected five bulk samples from Building 965 for analysis of asbestos. Schneider Laboratories, Inc., in Richmond, Virginia, analyzed the samples using polarized light microscopy (PLM). Schneider Laboratories, Inc. is accredited by the National Voluntary Laboratory Accreditation Program for analysis of bulk asbestos fibers. Four of the five samples tested positive for asbestos. The results of all samples analyzed by PLM for Building 965 are summarized in Table C-1 and Figure C-1, and included as Appendix C1.

Table C-1. All Asbestos Results for Building 965

Sample Number	Building Material Description	Material Location	Results (%)
965-ACM-1A	Yellow Paint	Exterior Concrete	No asbestos detected
965-ACM-2A	White Thermal System Insulation (TSI)	Throughout HVAC System Duct Joints and HVAC Unit	75% chrysotile
965-ACM-3A	Black Roof Mastic	Exterior Roof	3% chrysotile
965-ACM-3B	Roof Sealant	Exterior Roof	PACM[1]
965-ACM-4A	Beige Duct Cloth	Throughout HVAC System Ducts and HVAC Unit	75% chrysotile

Notes:

1. PACM material has not been analyzed by the laboratory because analytical data from a similar location, which is assumed to be homogeneous, was determined to be ACM.

The roof mastic and sealant constitute Category II non-friable ACM under National Emission Standards for Hazardous Air Pollutants (NESHAP). The TSI and duct cloth constitute friable ACM under NESHAP.

2.2. BUILDING 969

ERRG's inspector collected 16 bulk samples for analysis of asbestos from Building 969. Schneider Laboratories, Inc., in Richmond, Virginia, analyzed the samples by PLM. Five of the 16 samples tested positive for asbestos. Table C-2 summarizes the materials that were determined to be ACM, trace-ACM (<1 percent), or presumed ACM (PACM).

Table C-2. Positive Asbestos Results for Building 969

Building Material Description	Material Location	Material Condition	Estimated Quantity (square feet)	Results (%)
White Transite Panel	Exterior	Fair	4,600	20% chrysotile
Piping TSI	Boiler Room	Fair	50	20% chrysotile 5% amosite
Piping TSI	Boiler Room	Fair	50	PACM[1]
Piping TSI	Boiler Room	Fair	50	PACM[1]
White Paint	Exterior Transite Panels and Metal Corners	Fair	4,600	15% chrysotile

Notes:

1. PACM material has not been analyzed by the laboratory because analytical data from a similar location, which is assumed to be homogeneous, was determined to be ACM.

The transite panels are considered non-friable ACM (NESHAP Section 61.141). The paint is considered Category II non-friable ACM, but may be considered friable ACM (NESHAP Section 61.141) because it is attached to the transite panels and will be removed intact. The TSI constitutes friable ACM. The results of all samples analyzed by PLM for Building 969 are summarized in Table C-3 and Figure C-1, and included as Appendix C1.

Table C-3. All Asbestos Results for Building 969

Sample Number	Building Material Description	Sample Location	Results (%)
969-ACM-1A	Blue Painted Drywall	Room 1 Ceiling	No asbestos detected
969-ACM-1B	Blue Painted Drywall	Room 1 North Wall	No asbestos detected
969-ACM-1C	Blue Painted Drywall	Room 1 Ceiling	No asbestos detected
969-ACM-2A	Green Painted Drywall	Room 2	No asbestos detected
969-ACM-2B	Green Painted Drywall	Room 2	No asbestos detected
969-ACM-2C	Green Painted Drywall	Room 2	No asbestos detected
969-ACM-3A	White Transite Panel	Exterior	20% chrysotile
969-ACM-4A	Piping TSI	Boiler Room	20% chrysotile 5% amosite
969-ACM-4B	Piping TSI	Boiler Room	PACM[1]
969-ACM-4C	Piping TSI	Boiler Room	PACM[1]
969-ACM-5A	Duct Insulation	Boiler Room	No asbestos detected
969-ACM-6A	Exterior White Paint	Transite Panels and Metal Corners	15% chrysotile
969-ACM-7A	White Caulking	North Window	No asbestos detected

Table C-3. All Asbestos Results for Building 969 *(continued)*

Sample Number	Building Material Description	Sample Location	Results (%)
969-ACM-7B	White Caulking	South Window	No asbestos detected
969-ACM-7C	White Caulking	West Window	No asbestos detected
969-ACM-8A	Roof Shingle	Exterior	No asbestos detected

Notes:

1. PACM material has not been analyzed by the laboratory because analytical data from a similar location, which is assumed to be homogeneous, was determined to be ACM.

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Section 3. Lead-Based Paint Results

3.1. BUILDING 965

ERRG's inspector collected one bulk sample of loose and peeling paint for analysis of lead from Building 965. Schneider Laboratories, Inc., in Richmond, Virginia, analyzed the samples using flame atomic absorption analysis. Table C-4 and Figure C-2 summarizes the results of the sample, and complete results are included in Appendix C1.

Table C-4. Lead Results for Building 965

Sample Number	Paint Description	Sample Location	Results (% by weight)
965-LBP-1	Yellow Paint	Exterior Concrete	0.008

The yellow paint on the exterior concrete of the building was found to be below the U.S. Department of Housing and Urban Development (HUD) guidelines of 0.5 percent lead by weight or 5,000 milligrams per kilogram (mg/kg) (or parts per million [ppm]), thus the yellow paint is not considered to be LBP.

3.2. BUILDING 969

ERRG's inspector collected two bulk samples of loose and peeling paint for analysis of lead from Building 969. Schneider Laboratories, Inc., in Richmond, Virginia, analyzed the samples using flame atomic absorption analysis. Table C-5 and Figure C-2 summarizes the results of the sample, and complete results are included in Appendix C1.

Table C-5. Positive Lead Results for Building 969

Sample Number	Paint Description	Sample Location	Results (% by weight)
969-LBP-1	Blue Paint	East Exterior Wooden Doors	6.277
969-LBP-2	Green/Blue Paint	East Interior Wooden Doors	0.895

Both paint samples (paint on the east exterior wooden doors and east interior wooden doors) collected from Building 969 exhibited lead concentrations above the HUD guidelines of 0.5 percent lead by weight or 5,000 mg/kg (ppm) of lead; as a result, paint on Building 969 is considered to be LBP.

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Section 4. Other Hazardous Materials

Intact fluorescent light tubes may contain mercury vapor and fluorescent light ballasts may contain polychlorinated biphenyl (PCB) oil. No fluorescent light tubes were observed in either building. Fluorescent light ballasts were observed in Building 969.

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Section 5. Imminent Hazards

No imminent hazards were noted for either building on the dates of the inspections.

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Section 6. Summary and Recommendations

Friable ACM was identified in Building 965, and both friable ACM and LBP were identified in Building 969. All positive ACM or PACM should be properly removed, containerized, and disposed of by a licensed ACM abatement contractor prior to building deconstruction activities. All appropriate regulatory agencies should be notified before work begins. Hazardous ACM waste (friable) should be containerized and characterized for profiling, manifesting, and proper disposal. Nonhazardous ACM waste (non-friable) should be containerized separately and characterized for profiling, manifesting, and proper disposal.

LBP at Building 969 should be (1) moistened and scraped off of all interior and exterior areas where paint is peeling, blistering, or stratified; (2) properly containerized; (3) transported off site; and (4) disposed of in accordance with applicable regulations. A licensed, qualified transporter should transport LBP wastes under appropriate manifest to an appropriately certified landfill for disposal.

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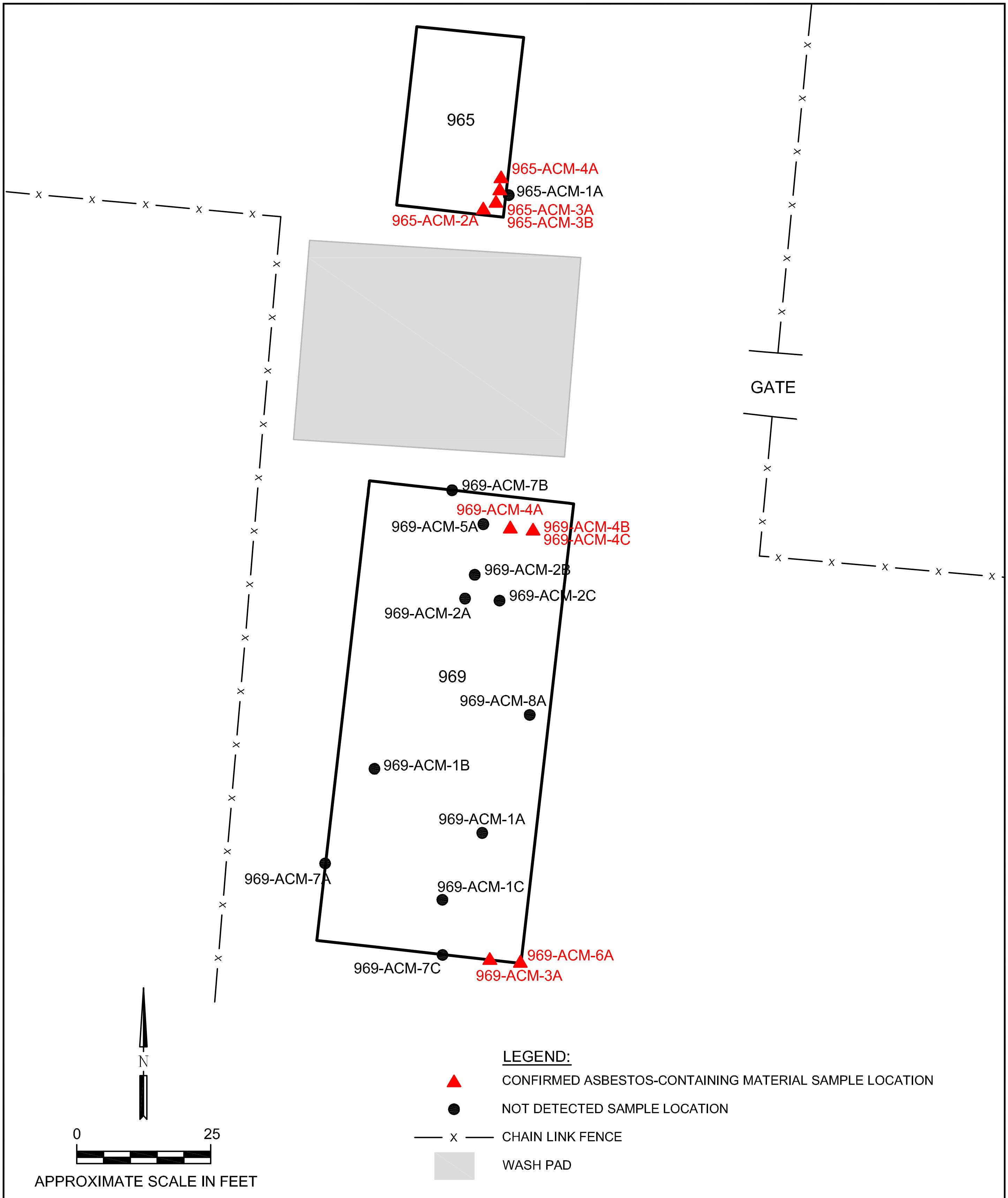
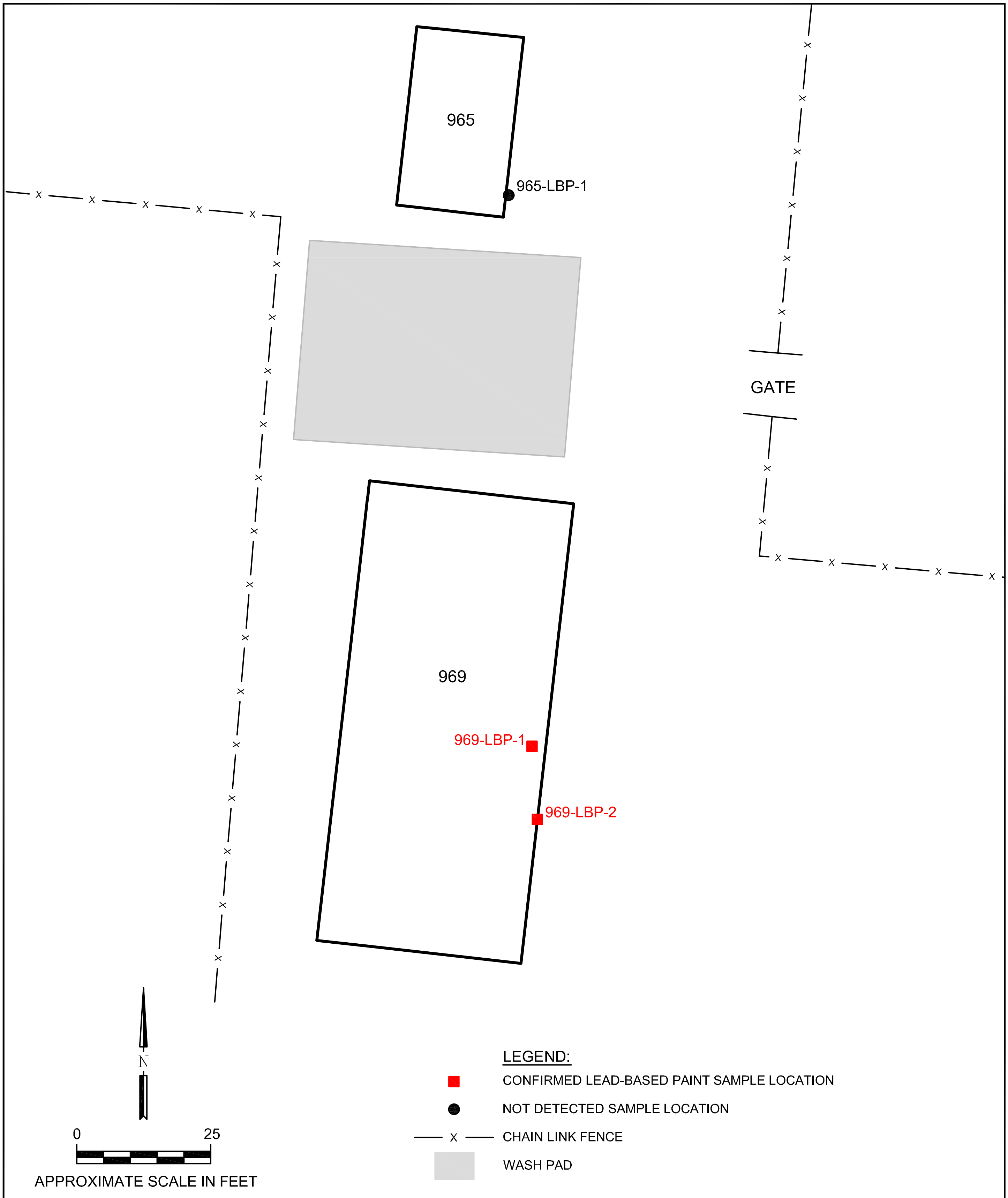


Engineering/Remediation Resources Group, Inc.
115 Sansome St., Suite 200
San Francisco, California 94104
(415) 395-9974
ERRG

CLIENT: DEPARTMENT OF THE NAVY	DESIGNED BY: RDB 9-14-09	ASBESTOS-CONTAINING MATERIAL SAMPLE LOCATIONS	
	CHECKED BY: MB 9-15-09		
LOCATION: FORMER DoDHF NOVATO, CALIFORNIA	P.E/P.G.: CG 9-15-09	ERRG PROJECT NO. 29-059	REVISION NO. 0

SHEET	OF	FIG NO.
1	1	C-1

N:\2009_Projects\29-059_Navy_Novato_NTCRAIN_Maps & Drawings\ACM Sample Locations .dwg



Engineering/Remediation Resources Group, Inc.
115 Sansome St., Suite 200
San Francisco, California 94104
(415) 395-9974
ERRG

CLIENT: DEPARTMENT OF THE NAVY	DESIGNED BY: RDB 9-14-09	LEAD-BASED PAINT SAMPLE LOCATIONS				
	CHECKED BY: MB 9-15-09					
LOCATION: FORMER DoDHF NOVATO, CALIFORNIA	P.E/P.G.: CG 9-15-09	ERRG PROJECT NO. 29-059	REVISION NO. 0	SHEET 1	OF 1	FIG NO. C-2

N:\2009_Projects\29-059_Navy_Novato_NTCRAIN_Maps & Drawings\LBP Sample Locations.dwg

Appendix C1. Laboratory Analysis Reports

SCHNEIDER LABORATORIES

INCORPORATED

2512 W. Cary Street • Richmond, Virginia • 23220-5117
804-353-6778 • 800-785-LABS (5227) • (FAX) 804-359-1475

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LABORATORY ANALYSIS REPORT

Asbestos Identification by EPA Method[1] 600/M4/82/020

Using SLI A6

ACCOUNT #:	3342-09-447	**DATE COLLECTED:**	6/12/2009
CLIENT:	Engineering/Remediation Resources Group	**DATE RECEIVED:**	7/1/2009
ADDRESS:	4585 Pacheco Blvd Attn: Ellen Rowland AP	**DATE ANALYZED:**	7/2/2009
	Martinez, CA 94553-2233	**DATE REPORTED:**	7/3/2009
PROJECT NAME:	Building 965		
JOB LOCATION:	Building 965		
PROJECT NO.:	29-059		
PO NO.:		**SampleType:**	BULK

Client Sample No.	SLI Sample/ Layer ID	Sample Identification/ Layer Name	PLM Analysis Results: Asbestos Fibers	PLM Analysis Results: Other Materials
965-ACM-1A	30222706	Exterior		
Layer 1:	Paint White, Brittle		None Detected	100% NON FIBROUS MATERIAL
965-ACM-2A	30222707	On Ducting		
Layer 1:	TSI White, Fibrous		75% CHRYSOTILE	25% NON FIBROUS MATERIAL

Hala Osman

Analyst: **HALA A. OSMAN**

Reviewed By: **Hind Eldanaf, Team Leader**

Total Number of Pages in Report: 1

Results relate only to samples as received by the laboratory. Visit www.slabinc.com for current certifications.

Samples analyzed by the EPA Test Method are subject to the limitations of light microscopy including matrix interference. Gravimetric reduction and correlative analyses are recommended for all non-friable, organically bound materials. This method has a reporting limit of 1% or greater. Visual estimation contains an inherent range of uncertainty. This report must not be reproduced except in full with the approval of the lab, and must not be used to claim NVLAP or other gov't agency endorsement.

3342-09-447

ERRG
Engineering/Remediation Resources Group, Inc.
185 Mason Circle, Suite A
Concord, CA 94520

P: 925.969.0750
F: 925.969.0751
www.errg.net

ACM BULK SAMPLE DATA SHEET

* PLM Analysis
* Stop Analysis at First Positive

US Navy Novato Buildings 965 & 969
ERRG Project No. 29-059

Sample(s) Sent to: Schneider Laboratories
2512 West Cary Street
Richmond, VA 23220

Turnaround Time: ~~5 days~~ 48 hours AB

Building Number: 965

Inspection/Sampling Date: 6/12/09

Building Name: Building 965

Inspector(s) Name(s), Firm: Anthony

Sample Number	Building Material Description	Sample Location (room number and direction)	Material Location (room numbers – all occurrences)	Material Condition (note rooms with damage)	Estimated Quantity (SF, LF)
965-ACM-1A	yellow paint	exterior, ~~(except roof)~~ AB	entire exterior, except roof	fair	1,000 SF
965-ACM-2A	TSI on Ducting 3a AB	on joints of ducts	throughout ducts and heating unit	fair	25 SF

Relinquished By: Anthony Broderick Signature: AB Date/Time: 6/12/09 1900

Received By: RC 7/1/09 10:00 fed 870104333 55ff Signature: Date/Time: (8)

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LABORATORY ANALYSIS REPORT

Asbestos Identification by EPA Method[1] 600/M4/82/020

Using SLI A6

ACCOUNT #:	3342-09-461	**DATE COLLECTED:**	9/2/2009
CLIENT:	Engineering/Remediation Resources Group	**DATE RECEIVED:**	9/4/2009
ADDRESS:	4585 Pacheco Blvd Attn: Ellen Rowland AP	**DATE ANALYZED:**	9/9/2009
	Martinez, CA 94553-2233	**DATE REPORTED:**	9/9/2009
PROJECT NAME:	US Navy N Bl 965&969		
JOB LOCATION:			
PROJECT NO.:	29-059		
PO NO.:		**SampleType:**	BULK

Client Sample No.	**SLI Sample/ Layer ID**	**Sample Identification/ Layer Name**	**PLM Analysis Results: Asbestos Fibers**	**PLM Analysis Results: Other Materials**
965-ACM-3A	30303460	Exterior Roof Top		
Layer 1:	Mastic Black, Bituminous		3% CHRYSOTILE	97% NON FIBROUS MATERIAL
965-ACM-3B	30303461	Exterior Roof Top		
Layer 1:	Sealant **Not analyzed due to positive stop instructions.**			
965-ACM-4A	30303462	Air Supply Rm		
Layer 1:	Duct Cloth Beige, Fibrous		75% CHRYSOTILE	25% NON FIBROUS MATERIAL

Analyst: **NATHANIEL VAUGHAN** **Reviewed By:** **Hind Eldanaf, Asbestos Area Mgr**

Total Number of Pages in Report: 1

Results relate only to samples as received by the laboratory. Visit www.slabinc.com for current certifications.

Samples analyzed by the EPA Test Method are subject to the limitations of light microscopy including matrix interference. Gravimetric reduction and correlative analyses are recommended for all non-friable, organically bound materials. This method has a reporting limit of 1% or greater. Visual estimation contains an inherent range of uncertainty. This report must not be reproduced except in full with the approval of the lab, and must not be used to claim NVLAP or other gov't agency endorsement.

33412-9-461

ERRG

Engineering/Remediation Resources Group, Inc.
185 Mason Circle, Suite A
Concord, CA 94520

P: 925.969.0750
F: 925.969.0751
www.errg.net

ACM BULK SAMPLE DATA SHEET

* PLM Analysis
* Stop Analysis at First Positive

US Navy Novato Buildings 965 & 969
ERRG Project No. 29-059

Sample(s) Sent to: Schneider Laboratories
2512 West Cary Street
Richmond, VA 23220

Turnaround Time: ~~5 days~~ MB 48 hours

Building Number: 965

Inspection/Sampling Date: 9/2/09

Building Name: Building 965

Inspector(s) Name(s), Firm: Tyson Appel - M. Boronda ERRG

Sample Number	Building Material Description	Sample Location (room number and direction)	Material Location (room numbers – all occurrences)	Material Condition (note rooms with damage)	Estimated Quantity (SF, LF)
965-ACM-3A	Mastic seal of roof penetration	SE corner of roof	exterior roof top	fair	~~1000~~ MB SF 150
965-ACM-3B	roof sealant	SE corner of roof	exterior roof top	good	~~1000~~ MB SF 150
* 965-ACM-4A	air supply ducting seal	room in SE corner	air supply room heater 4 x 4 x 6	poor	25 SF

* penetration of air duct thru roof is transite

Relinquished By: MBoronda Signature: Melissa Boronda Date/Time: 9/3/09 0940

Received By: Kaveh Abouzari Signature: KAZ Date/Time: 9/4/09 7:34 AM

797904326537S

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LABORATORY ANALYSIS REPORT

Asbestos Identification by EPA Method[1] 600/M4/82/020

Using SLI A6

ACCOUNT #:	3342-09-445	**DATE COLLECTED:**	6/12/2009
CLIENT:	Engineering/Remediation Resources Group	**DATE RECEIVED:**	7/1/2009
ADDRESS:	4585 Pacheco Blvd Attn: Ellen Rowland AP	**DATE ANALYZED:**	7/2/2009
	Martinez, CA 94553-2233	**DATE REPORTED:**	7/3/2009
PROJECT NAME:	Building 969		
JOB LOCATION:	Building 969		
PROJECT NO.:	29-059		
PO NO.:		**SampleType:**	BULK

Client Sample No.	SLI Sample/ Layer ID	Sample Identification/ Layer Name	PLM Analysis Results: Asbestos Fibers	PLM Analysis Results: Other Materials
969-ACM-1A	30222689	Rm 1 Ceiling		
Layer 1:		Drywall White, Powdery	None Detected	5% CELLULOSE FIBER 95% NON FIBROUS MATERIAL
969-ACM-1B	30222690	Rm 1 N		
Layer 1:		Drywall White, Powdery	None Detected	5% CELLULOSE FIBER 95% NON FIBROUS MATERIAL
969-ACM-1C	30222691	Rm 1 Ceiling		
Layer 1:		Drywall White, Powdery	None Detected	5% CELLULOSE FIBER 95% NON FIBROUS MATERIAL
969-ACM-2A	30222692	Rm 2 N		
Layer 1:		Drywall White, Powdery	None Detected	6% CELLULOSE FIBER 94% NON FIBROUS MATERIAL
969-ACM-2B	30222693	Rm 2 S		
Layer 1:		Drywall White, Powdery	None Detected	5% CELLULOSE FIBER 95% NON FIBROUS MATERIAL

Total Number of Pages in Report: 3

Results relate only to samples as received by the laboratory.

Visit www.slabinc.com for current certifications.

Samples analyzed by the EPA Test Method are subject to the limitations of light microscopy including matrix interference. Gravimetric reduction and correlative analyses are recommended for all non-friable, organically bound materials. This method has a reporting limit of 1% or greater. Visual estimation contains an inherent range of uncertainty. This report must not be reproduced except in full with the approval of the lab, and must not be used to claim NVLAP or other gov't agency endorsement.

Client Sample No.	SLI Sample/ Layer ID	Sample Identification/ Layer Name	PLM Analysis Results: Asbestos Fibers	PLM Analysis Results: Other Materials
969-ACM-2C	30222694	Rm 2 N		
	Layer 1:	Drywall White, Powdery	None Detected	5% CELLULOSE FIBER 95% NON FIBROUS MATERIAL
969-ACM-3A	30222695	S Exterior		
	Layer 1:	Transite White, Hard	20% CHRYSOTILE	80% NON FIBROUS MATERIAL
969-ACM-4A	30222696	Boiler Rm		
	Layer 1:	TSI White, Powdery/Fibrous	20% CHRYSOTILE 5% AMOSITE	15% CELLULOSE FIBER 60% NON FIBROUS MATERIAL
969-ACM-4B	30222697	Boiler Rm		
	Layer 1:	TSI **Not analyzed due to positive stop instructions.**		
969-ACM-4C	30222698	Boiler Rm		
	Layer 1:	TSI **Not analyzed due to positive stop instructions.**		
969-ACM-5A	30222699	Boiler Rm		
	Layer 1:	Duct Insulation Yellow/Clear, Fibrous	None Detected	85% FIBERGLASS 15% NON FIBROUS MATERIAL
969-ACM-6A	30222700	SE Corner		
	Layer 1:	Paint/Fibrous/Mtrl White/Beige, Soft/Fibrous **Unable to separate individual layers.**	15% CHRYSOTILE	20% CELLULOSE FIBER 65% NON FIBROUS MATERIAL
969-ACM-7A	30222701	N Window		
	Layer 1:	Caulk White, Granular	None Detected	100% NON FIBROUS MATERIAL
969-ACM-7B	30222702	S Window		
	Layer 1:	Caulk White, Granular	None Detected	100% NON FIBROUS MATERIAL

Total Number of Pages in Report: 3

Results relate only to samples as received by the laboratory. Visit www.slabinc.com for current certifications.

Samples analyzed by the EPA Test Method are subject to the limitations of light microscopy including matrix interference. Gravimetric reduction and correlative analyses are recommended for all non-friable, organically bound materials. This method has a reporting limit of 1% or greater. Visual estimation contains an inherent range of uncertainty. This report must not be reproduced except in full with the approval of the lab, and must not be used to claim NVLAP or other gov't agency endorsement.

Client Sample No.	SLI Sample/ Layer ID	Sample Identification/ Layer Name	PLM Analysis Results Asbestos Fibers	Other Materials
969-ACM-7C	30222703	W Window		
Layer 1:		Caulk White, Granular	None Detected	100% NON FIBROUS MATERIAL

Analyst: **MONA F. TARABAY**

Reviewed By: **Hind Eldanaf, Team Leader**

Total Number of Pages In Report: 3

Results relate only to samples as received by the laboratory.

Visit www.slabinc.com for current certifications.

Samples analyzed by the EPA Test Method are subject to the limitations of light microscopy including matrix interference. Gravimetric reduction and correlative analyses are recommended for all non-friable, organically bound materials. This method has a reporting limit of 1% or greater. Visual estimation contains an inherent range of uncertainty. This report must not be reproduced except in full with the approval of the lab, and must not be used to claim NVLAP or other gov't agency endorsement.

3342-09-445

ERRG
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185 Mason Circle, Suite A
Concord, CA 94520

P: 925.969.0750
F: 925.969.0751
www.errg.net

ACM BULK SAMPLE DATA SHEET

* PLM Analysis
* Stop Analysis at First Positive

US Navy Novato Buildings 965 & 969
ERRG Project No. 29-059

Sample(s) Sent to: Schneider Laboratories
2512 West Cary Street
Richmond, VA 23220

Turnaround Time: ~~5 days~~ 48 hours AB

Building Number: 969

Inspection/Sampling Date: 6/12/09

Building Name: Building 969

Inspector(s) Name(s), Firm: Anthony Broderick, ERRG

Sample Number	Building Material Description	Sample Location (room number and direction)	Material Location (room numbers – all occurrences)	Material Condition (note rooms with damage)	Estimated Quantity (SF, LF)
969-ACM-1A	blue painted drywall, nailed on	Room 1, ceiling	ceiling of Room 1 and Room 1 north wall	ceiling, poor	85x30+ 600 SF
969-ACM-1B	" "	Room 1, North	" "	north wall, fair	" "
969-ACM-1C	" "	Room 1, ceiling	" "	ceiling, poor	" "
969-ACM-2A	green painted drywall, nailed on	Room 2, North	througnout Room 2	fair	2,000 SF
969-ACM-2B	green painted drywall, nailed on	Room 2, South	" "	" "	" "
969-ACM-2C	green painted drywall, nailed on	Room 2, North	" "	" "	~~85x20x2+~~ AB " "
969-ACM-3A	white transite panel	S exterior	entire exterior	fair	85x20x2+ 30x20x2 SF
969-ACM-4A	TSI on piping	boiler room	boiler room	fair	50 LF
969-ACM-4B	" "	boiler room	" "	" "	" "
969-ACM-4C	" "	boiler room	" "	" "	" "
969-ACM-5A	duct insulation	boiler room, on boiler	boiler room	fair	25 SF

Relinquished By: Anthony Broderick Signature: AB Date/Time: 6/12/09 1900

Received By: ~~JC 7/1/09 10:00~~ Signature: Fed 870104333588 Date/Time: (S)

3342-09-445

ERRG

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185 Mason Circle, Suite A
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P: 925.969.0750
F: 925.969.0751
www.errg.net

ACM BULK SAMPLE DATA SHEET

* PLM Analysis
* Stop Analysis at First Positive

US Navy Novato Buildings 965 & 969
ERRG Project No. 29-059

Sample(s) Sent to: Schneider Laboratories
2512 West Cary Street
Richmond, VA 23220

Turnaround Time: ~~5 days~~ 48 hours AB

Building Number: 969

Inspection/Sampling Date: 6/12/09

Building Name: Building 969

Inspector(s) Name(s), Firm: Anthony Broderick, ERRG

Sample Number	Building Material Description	Sample Location (room number and direction)	Material Location (room numbers – all occurrences)	Material Condition (note rooms with damage)	Estimated Quantity (SF, LF)
969-ACM-6A	white exterior paint	SE corner	on transite panels and metal corners	fair	85x20x2+ 30x20x2
969-ACM-7A	white loose caulk on windows	N window	~~caulking on~~ AB N window	poor	~150 SF
969-ACM-7B	" "	S window	S window	" "	" "
969-ACM-7C	" "	W window	W window	" "	" "

Relinquished By: Anthony Broderick Signature: AB Date/Time: 6/12/09 1900

Received By: Signature: Date/Time:

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LABORATORY ANALYSIS REPORT

Asbestos Identification by EPA Method[1] 600/M4/82/020

Using SLI A6

ACCOUNT #:	3342-09-460	**DATE COLLECTED:**	9/2/2009
CLIENT:	Engineering/Remediation Resources Group	**DATE RECEIVED:**	9/4/2009
ADDRESS:	4585 Pacheco Blvd Attn: Ellen Rowland AP	**DATE ANALYZED:**	9/9/2009
	Martinez, CA 94553-2233	**DATE REPORTED:**	9/9/2009
PROJECT NAME:	US Navy N B965&969		
JOB LOCATION:			
PROJECT NO.:	29-059		
PO NO.:		**SampleType:**	BULK

Client Sample No.	SLI Sample/ Layer ID	Sample Identification/ Layer Name	PLM Analysis Results: Asbestos Fibers	PLM Analysis Results: Other Materials
969-ACM-8A	30303436	Exterior Roof		
Layer 1:		Shingle Brown/Black, Bituminous	None Detected	18% MINERAL/GLASS WOOL 82% NON FIBROUS MATERIAL

Analyst: **NATHANIEL VAUGHAN**

Reviewed By: **Hind Eldanaf, Asbestos Area Mgr**

Total Number of Pages in Report: 1

Results relate only to samples as received by the laboratory.

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Samples analyzed by the EPA Test Method are subject to the limitations of light microscopy including matrix interference. Gravimetric reduction and correlative analyses are recommended for all non-friable, organically bound materials. This method has a reporting limit of 1% or greater. Visual estimation contains an inherent range of uncertainty. This report must not be reproduced except in full with the approval of the lab, and must not be used to claim NVLAP or other gov't agency endorsement.

3342-9-460

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185 Mason Circle, Suite A
Concord, CA 94520

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ACM BULK SAMPLE DATA SHEET

* PLM Analysis
* Stop Analysis at First Positive

US Navy Novato Buildings 965 & 969
ERRG Project No. 29-059

Sample(s) Sent to: Schneider Laboratories
2512 West Cary Street
Richmond, VA 23220

Turnaround Time: ~~5 days~~ MSB 48 hours

Building Number: 969

Inspection/Sampling Date: 9/2/09

Building Name: Building 969

Inspector(s) Name(s), Firm: T. Appel & M. Boronda ERRG

Sample Number	Building Material Description	Sample Location (room number and direction)	Material Location (room numbers – all occurrences)	Material Condition (note rooms with damage)	Estimated Quantity (SF, LF)
969-ACM-9A	roof shingle ~~discrip~~ MSB	E side of Mid roof	exterior roof top	fair	660 SF
exterior shingles of building are transite					

Relinquished By: MSBoronda Signature: Melissa Boronda Date/Time: 9/3/09 0940

Received By: Kamin Abouzalti Signature: KA7 Date/Time: 9/4/09 7:34 AM

4979 04386275

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LABORATORY ANALYSIS REPORT

Lead Analysis based on EPA 7000B Method

Using SLI P26 A14

ACCOUNT #:	3342-09-448	**DATE COLLECTED:**	6/12/2009
CLIENT:	Engineering/Remediation Resources Group	**DATE RECEIVED:**	7/1/2009
ADDRESS:	4585 Pacheco Blvd Attn: Ellen Rowland AP	**DATE ANALYZED:**	7/2/2009
	Martinez, CA 94553-2233	**DATE REPORTED:**	7/3/2009
PROJECT NAME:	Building 965		
JOB LOCATION:	Building 965		
PROJECT NO.:	29-059		
PO NO.:		**Sample Type:**	BULK

SLI Sample No.	Client Sample No.	Sample Description	Sample Wt (mg)	Total Lead (µg)*	Lead Conc (% by wt)	Lead Conc PPM
30222708	965-LBP-1	Yellow Ext W	964	79.6	0.008	83

Analysis Run ID: 43811

Analyst: MOHAMMED ELTILIB

Total Number of Pages in Report: 1

Results relate only to samples as received by the laboratory.

Alfreda R. Jones

Reviewed By **Alfreda R. Jones, Data Management**

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*Minimum Reporting Limit: 20.0 µg. For work involving HUD, child-occupied building and other residential units, the Federal Lead Standard for paint is 0.5% lead by weight [5000 ppm]. *Data precision justifies 2 significant figures. Unusual sample conditions, if any, are described. All testing is performed in strict accordance with Schneider Laboratories, Inc. protocol.*

3342-09-448

ERRG

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Lead BULK SAMPLE DATA SHEET

* Total Lead Analysis

PAGE 1 OF 1

US Navy Novato Buildings 965 & 969
ERRG Project No. 29-059

Sample(s) Sent to: Schneider Laboratories
2512 West Cary Street
Richmond, VA 23220

Turnaround Time: ~~5 days~~ 48 hours AB

Building Number: 965

Inspection/Sampling Date: 6/12/09

Building Name: Building 965

Inspector(s) Name(s), Firm: Anthony Broderick, ERRG

Sample Number	Building Material Description	Sample Location (room number and direction)	Material Location (room numbers – all occurrences)	Material Condition (note rooms with damage)	Estimated Quantity (SF, LF)
965-LBP-1	yellow paint	exterior, west	entire exterior (except roof)	fair	1,000 SF

Relinquished By: Anthony Broderick Signature: [signature] Date/Time: 6/12/09 1900

Received By: RC 7/1/09 10:00 Signature: 870104333588 Date/Time: (S)

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LABORATORY ANALYSIS REPORT

Lead Analysis based on EPA 7000B Method

Using SLI P26 A14

ACCOUNT #:	3342-09-446	**DATE COLLECTED:**	6/12/2009
CLIENT:	Engineering/Remediation Resources Group	**DATE RECEIVED:**	7/1/2009
ADDRESS:	4585 Pacheco Blvd Attn: Ellen Rowland AP	**DATE ANALYZED:**	7/2/2009
	Martinez, CA 94553-2233	**DATE REPORTED:**	7/3/2009
PROJECT NAME:	Building 969		
JOB LOCATION:	Building 969		
PROJECT NO.:	29-059		
PO NO.:		**Sample Type:**	BULK

SLI Sample No.	Client Sample No.	Sample Description	Sample Wt (mg)	Total Lead (µg)*	Lead Conc (% by wt)	Lead Conc PPM
30222704	969-LBP-1	Blue Ext E Drs	969	60,824.0	6.277	62,770
30222705	969-LBP-2	Green/Blue Int E Drs	938	8,393.1	0.895	8,948

Analysis Run ID: 43811

Analyst: **MOHAMMED ELTILIB**

Total Number of Pages in Report: 1

Results relate only to samples as received by the laboratory.

Alfreda R. Jones

Reviewed By **Alfreda R. Jones, Data Management**

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*Minimum Reporting Limit: 20.0 µg. For work involving HUD, child-occupied building and other residential units, the Federal Lead Standard for paint is 0.5% lead by weight [5000 ppm]. *Data precision justifies 2 significant figures. Unusual sample conditions, if any, are described. All testing is performed in strict accordance with Schneider Laboratories, Inc. protocol.*

3342.09.446

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Lead BULK SAMPLE DATA SHEET

* Total Lead Analysis

US Navy Novato Buildings 965 & 969
ERRG Project No. 29-059

Sample(s) Sent to: Schneider Laboratories
2512 West Cary Street
Richmond, VA 23220

Turnaround Time: ~~5 days~~ 48 hours AB

Building Number: 969 Inspection/Sampling Date: 6/12/09

Building Name: Building 969 Inspector(s) Name(s), Firm: Anthony Broderick, ERRG

Sample Number	Building Material Description	Sample Location (room number and direction)	Material Location (room numbers – all occurrences)	Material Condition (note rooms with damage)	Estimated Quantity (SF, LF)
969-LBP-1	Blue exterior paint	East doors, exterior	east doors	poor	1200 SF
969-LBP-2	green/blue interior paint	East Doors, interior	throughout Room 1	poor	3750 SF

Relinquished By: Anthony Broderick Signature: AB Date/Time: 6/12/09 1900

Received By: 2/1/09 10:00 Signature: 870104333588 Date/Time (S)

Appendix D. Applicability Review of Bay Area Air Quality Management District Regulation 2 Permit, Rule 5, New Source Review of Toxic Air Contaminants

Applicability Review of Bay Area Air Quality Management District (BAAQMD) Regulation 2 Permit, Rule 5, New Source Review of Toxic Air Contaminants Relative to Time Critical Removal Action DOD Housing Novato, CA

As described in the BAAQMD Regulation 2-5-101, the purpose of this rule is to provide for the review of new sources of toxic air contaminant (TAC) emissions in order to evaluate potential public exposure and health risk and to mitigate potentially significant health risks resulting from these exposures. An exemption to the provisions of this rule is provided for sources where the increase in emissions of each TAC is below a contaminant-specific trigger level. The potential TAC emissions from this project include benzene, ethylbenzene, methyl t-butyl ether, toluene, trichloroethylene, vinyl chloride, xylenes, 1,1-dichloroethylene, and 1,3-butadiene[1]. The acute trigger levels provided in this regulation include 2.9 pounds per hour (lb/hr) for benzene, 82 lb/hr for toluene, 400 lb/hr for vinyl chloride, and 49 lb/hr for xylenes. BAAQMD Regulation 2, Rule 5 does not list Acute Trigger Levels for ethylbenzene, methyl t-butyl ether, trichloroethene, 1,3-butadiene, or 1,1-dichloroethene.

The Acute Trigger Levels provided in Regulation 2, Rule 5 were based on a cavity effects screening-level dispersion model procedure that relates emission rate to 1-hour average ambient air concentrations. Specifically, the Acute Trigger Level is based on the assumption that the emission source continuously emits the TAC (for at least an hour) at a rate that produces a cavity region concentration equal to the chemical-specific acute Reference Exposure Level (REL). This methodology assumes that a source that emits a TAC at a rate less than the Acute Trigger Level, even under the conservative aerodynamic downwash conditions, would result in an ambient air concentration below the acute REL, which represents an air concentration that is not likely to cause adverse effects in a human population, including sensitive subgroups, exposed on an intermittent basis for a one-hour period.

Because published acute inhalation RELs do not exist for ethylbenzene, methyl t-butyl ether, trichloroethylene, 1,1-dichloroethylene, and 1,3-butadiene, acute inhalation exposure criteria were obtained from alternative sources, including the U.S. EPA Acute Exposure Guideline Levels (AEGL) and the US Department of Energy Temporary Emergency Exposure Limits (TEEL) when AEGL values were unavailable. 1-hour average AEGL values of 1.80×10^5 microgram per cubic meter ($\mu g/m^3$) for methyl t-butyl ether, 6.97×10^5 $\mu g/m^3$ for trichloroethene, and 1.48×10^6 $\mu g/m^3$ for 1,3-butadiene were obtained. 15-minute peak TEEL values of 4.36×10^5 $\mu g/m^3$ and 1.98×10^4 $\mu g/m^3$ were obtained for ethylbenzene and 1,1-dichloroethene. The TEEL values were extrapolated from a 15-minute to a 1-hour basis using a methodology employed by Cal/EPA to develop acute RELs (Cal/EPA, 1999). The 1-hour TEEL values are 1.08×10^5 $\mu g/m^3$ for ethylbenzene and 4.95×10^3 $\mu g/m^3$ for 1,1-dichloroethene.

Acute Trigger Levels for ethylbenzene, methyl t-butyl ether, trichloroethene, 1,1-dichloroethene, and 1,3-butadiene were calculated from the AEGL-1 and TEEL values using the methodology provided in Appendix C to the BAAQMD's April 2003 Staff Report for the proposed adoption of Regulation 2, Rule 5. This methodology employed the cavity effects screening-level dispersion model procedure that relates emission rate to 1-hour average ambient air concentrations. The resulting Acute Trigger Levels are 238 lb/hr for ethylbenzene, 396 lb/hr for methyl t-butyl ether, 1,534 lb/hr for trichloroethene, 3,254 lb/hr for 1,3-butadiene, and 10.9 lb/hr for 1,1-dichloroethene.

Benzene, ethylbenzene, methyl t-butyl ether, toluene, trichloroethene, vinyl chloride, m-, p-xylenes, 1,3-butadiene, and 1-1-dichloroethene have been measured in the soil gas of the Parcel 1A study area at

[1] Only chemicals with BAAQMD Trigger Levels have been evaluated for TAC emissions. Acute Trigger Levels, as opposed to Chronic Trigger Levers, are more appropriate to use for the excavation of soil because the duration of excavation is shore (i.e., the duration of excavation of soils is expected to be less than 5 days).

maximum concentrations of 1,000 μg/m^3, 11,000 μg/m^3, 160 μg/m^3, 50,000 μg/m^3, 1,100 μg/m^3,14,000 μg/m^3, 31,000 μg/m^3, 260 μg/m^3, and 820 μg/m^3, respectively.

In order to estimate a conservative emission rate for the TACs, the following assumptions were made:

- Volume of soil excavation would be 800 m^3
- Entire volume of soil would be excavated in one hour
- All of the soil gas contained in the 800 m^3 of soil is released during excavation
- soil-air porosity of 0.5

The estimated total mass emission rate for each of these TACs is summarized in Table 1. As shown on Table 1, the TAC emission rates would be significantly less than the hourly emission rate of the applicable Acute Trigger Levels.

Table 1. TAC Emission Rates and Comparison to BAAQMD Acute Trigger Levels

TAC	Maximum Soil Gas Concentration (μg/m^3)	Soil Excavation Rate[(a)] (m^3/hr)	Volume of Soil Gas Released[(b)] (m^3/hr)	Estimated TAC Emission Rate[(c)] (lb/hr)	BAAQMD Acute Trigger Level[(d)] (lb/hr)
benzene	1,000	800	400	0.00088	2.9
ethylbenzene	11,000	800	400	0.0097	238
methyl t-butyl ether	160	800	400	0.00014	396
toluene	50,000	800	400	0.044	82
trichloroethene	1,100	800	400	0.00097	1,534
vinyl chloride	14,000	800	400	0.012	400
m-, p-xylene	31,000	800	400	0.027	49
1,3-butadiene	260	800	400	0.00023	3,254
1,1-dichloroethene	820	800	400	0.00072	10.9

a. Soil excavation rate assumes the entire subject area is excavated in one hour.
b. Volume of soil gas released is equal to the soil excavation rate multiplied by the porosity. A soil porosity of 0.5 was conservatively assumed for this calculation.
c. TAC emission rates estimated by multiplying the maximum soil gas concentration by the volume of soil gas released and then converted to lb/hour by multiplying by 2.2 x 10^{-9}.
d. A trigger level is an emission threshold level below which the resulting health risks are not expected to cause, or contribute significantly to adverse health effects.

Using the conservative assumptions described above, approximately 1.4 million m^3 of soil would have to be excavated per hour to reach the Acute Trigger Level of the worst case TAC (i.e., toluene). Therefore, it can be concluded from these conservative estimates that this project will not release these TAC above the acute trigger levels, and, as such, will be exempt from the requirements of BAAQMD Regulation 2, Rule 5.

References:

Cal/EPA. 1999. "Air Toxics Hot Spot Program Risk Assessment Guidelines, Part I, The Determination of Acute Reference Exposure Levels for Airborne Toxicants." Office of Environmental Health Hazard Assessment. March.

Bay Area Air Quality Management District, 2003. “Draft Staff Report for the Proposed Adoption of Regulation 2, Rule 5, Appendix C “. Toxic Evaluation Section, Permit Services Division. April.

Appendix E. Responses to Regulatory Agency Comments on the Draft Removal Action Work Plan

Table E1. Responses to Comments from Department of Toxic Substances Control (DTSC) on the Draft Removal Action Work Plan, Non-Time-Critical Removal Action for the Building 965 Area, Former Department of Defense Housing Facility, Novato, California, August 2009

Comment #	Section	Comment	Response
Comments provided by DTSC Geological Services Unit (Michelle Dalrymple), dated August 24, 2009			
Specific Comments and Recommendations			
1	5.4	Section 5.4 – Asphalt Pavement and Concrete Removal. The asphalt pavement removal areas shown on Figure 6 does not include the area of elevated ethyl benzene at SG-1A-16. Please clarify how this area will be addressed if it is found to contain levels of ethylbenzene or other chemicals above the project action levels in the pre-excavation soil gas samples.	Pavement in the area of SG-1A-16 is not proposed for removal, because it is not part of the likely source area for VOCs identified in the site conceptual model. Following removal of the pavement, the Navy will collect pre-excavation soil gas samples, as identified on Figure 7 of the Work Plan, to evaluate site conditions prior to removing the source area of VOCs. The pre-excavation data, along with confirmation soil gas data, will be used to evaluate the effectiveness of the removal action and to quantitatively assess potential risks to human health, in accordance with the approach outlined in the Risk Assessment White Paper (Battelle Memorial Institute [Battelle], 2009). As noted in Section 5.5 and Figure 7, the Navy proposes to collect a pre-excavation soil gas sample (PSG-1A-1) at the same location as SG-1A-16. All soil gas results will be reviewed relative to the site-wide post-excavation risk assessment. Contingency aspects of the CERCLA remedy can be further evaluated based on the results of this risk assessment.
2	5.5	Section 5.5 – Pre-Excavation Sampling. a. GSU recommends additional pre-excavation soil gas samples be collected at the following locations: • Beneath the northern portion of Building 969 to fill a data gap that was a result of inaccessibility within the building. • West of the center of the wash pad to delineate the western extent of contamination on Lanham Village property.	a. Based on historic data, elevated concentrations of VOCs were all within and north of the footprint of the former wash pad. The Navy has evaluated existing soil gas data south of the pad area and believes that the extent of soil gas is adequately delineated by sample results for locations SG-1A-19 and PS-1A-9, where VOC concentrations were below screening levels. Also, excavation sloping (required for sidewall stability) will extend south of the pad to the footprint of Building 969. Confirmation sidewall samples will be collected from the excavation prior to backfilling. If analytical data from the confirmation samples indicate VOCs are present in soil, then the Navy would authorize additional excavation. Over-excavation, if required, would proceed by excavating soil in 2-foot increments and collecting confirmation samples until acceptable results were achieved.

Table E1. Responses to Comments from Department of Toxic Substances Control (DTSC) on the Draft Removal Action Work Plan, Non-Time-Critical Removal Action for the Building 965 Area, Former Department of Defense Housing Facility, Novato, California, August 2009

Comment #	Section	Comment	Response
2 *(cont.)*	5.5	b. Please revise the text to indicate that soil gas samples will be analyzed using EPA Method TO-15 rather than EPA Method 8260B, as per the Sampling and Analysis Plan (SAP).	The location of pre-excavation soil gas sample (PSG-1A-3; Figure 7) will be moved to align with the center of the wash pad, adjacent to Lanham Village property. Navy policy prohibits the Navy from collecting soil gas samples on transferred property if no proven exposure pathway exists (Navy, 2008[1]). Therefore, sample PSG-1A-3 will be located just inside the property boundary. The portion of Lanham Village property in question is open space and unpaved with no established exposure pathway. In addition, a portion of Lanham Village's property in this area was excavated in the 1980s during installation of the flood control channel. Finally, excavation sloping (required for sidewall stability) will extend onto this portion of Lanham Village's property. Confirmation sidewall samples will be collected from the excavation prior to backfilling. If analytical data from the confirmation samples indicate VOCs are present in soil, then the Navy would authorize additional excavation in this direction, following approval from the Lanham Village Homeowner's Association. Over-excavation, if required, would proceed by excavating soil in 2-foot increments and collecting confirmation samples until acceptable results were achieved. b. The text has been revised accordingly.
3	5.7	<u>Section 5.7 – Post-Excavation Confirmation Sampling (Soil)</u>. a. Please clarify that the EPA Region 9 Regional Screening Levels (RSLs) for residential soil will be the numerical values used to determine whether soil confirmation samples are within acceptable levels (see Comment 5). b. Please explain what course of action will be undertaken if post-excavation confirmation soil samples are found to contain unacceptable levels of VOCs.	a. The text has been revised to indicate that EPA Region 9 RSLs for residential soil will be used as screening levels. b. The text of Section 5.7 has been revised to read: *"Following excavation activities, ERRG will collect additional soil samples to confirm that VOC-contaminated soil has been removed, and that the RAO to reduce and/or manage human health risk at the site to acceptable levels (Battelle, 2009a) has been achieved.*

[1] Department of the Navy, 2008. "Navy/Marine Corps Policy on Vapor Intrusion." April 29. Ser N453/8U158104.

Table E1. Responses to Comments from Department of Toxic Substances Control (DTSC) on the Draft Removal Action Work Plan, Non-Time-Critical Removal Action for the Building 965 Area, Former Department of Defense Housing Facility, Novato, California, August 2009

Comment #	Section	Comment	Response
3 *(cont.)*	5.7	Section 5.7 – Post-Excavation Confirmation Sampling (Soil). a. Please clarify that the EPA Region 9 Regional Screening Levels (RSLs) for residential soil will be the numerical values used to determine whether soil confirmation samples are within acceptable levels (see Comment 5). b. Please explain what course of action will be undertaken if post-excavation confirmation soil samples are found to contain unacceptable levels of VOCs.	*In total, 10 soil confirmation samples will be collected from the excavation (between the bottom and the sidewalls [Figure 8]). The soil samples will be collected from discrete locations between 4 and 7 feet bgs that are representative of both the upper 5 feet (relatively high permeability material) and the underlying (less permeable) material. Analytical results will be compared with EPA Region 9 regional screening levels (RSLs) for residential soil to determine whether VOCs remain in soil at concentrations that may pose an unacceptable risk to humans. If concentrations of VOCs in soil exceed RSLs, additional soil will be excavated until results of the confirmation samples indicate VOCs are below RSLs. Soil sampling procedures are outlined in the SAP (Appendix A).”*
4	5.10	Section 5.10 – Post-Excavation Confirmation Sampling (Soil Gas). a. GSU recommends that soil gas sample location CSG-1A-1 be moved due north, to the northern perimeter of the excavation, to evaluate VOC concentrations that might be migrating into the clean backfill soil under a concentration-driven gradient. b. GSU recommends that the Navy consider adding post-excavation soil gas samples based on the results of the pre-excavation soil gas samples to be collected in the vicinity of the wash pad, particularly beneath Building 965, Building 969, west of the former wash pad, and adjacent to SG-1A-16. c. Please revise the text to indicate that soil gas samples will be analyzed using EPA Method TO-15 rather than EPA Method 8260B, as per the SAP. d. The text states that soil gas samples will be collected from depths consistent with the depth intervals where samples were collected in May 2008; however, it does not provide the depth intervals. Please provide the proposed depth intervals for post-excavation soil gas samples (see Comments 6(a) and 8(a)). e. Please correct the symbol on Figure 7 to show that ESG-7 was an NUSD sample.	a. The sample location on Figure 9 has been adjusted as suggested. The following text has been added to Table 5 under “Sampling Rationale” for that sample, “*Confirm source of VOCs is no longer present and evaluate potential for VOCs to migrate into clean backfill.”* b. The Navy will evaluate the need for additional post-excavation confirmation soil gas sample locations following removal activities. If pre-excavation sample results justify adding or moving sample locations, the Navy will discuss such changes with the regulatory agencies. c. The text has been revised accordingly. d. A column for “Proposed Sample Depths” has been added to Table 5. The text in Section 5.10 that references this table has been revised appropriately for consistency with the table. Figure 9 has also been revised to be consistent with Section 5.10 and Table 5. e. The figure has been revised accordingly.

Table E1. Responses to Comments from Department of Toxic Substances Control (DTSC) on the Draft Removal Action Work Plan, Non-Time-Critical Removal Action for the Building 965 Area, Former Department of Defense Housing Facility, Novato, California, August 2009

Comment #	Section	Comment	Response
5	--	Appendix A, SAP Worksheet #15.3 and SAP Worksheet #15.7 – Reference Limits and Evaluation Table. Please note that DTSC Human and Ecological Risk Division issued a "note" regarding its evaluation of the EPA Region 9 RSLs. Based on this evaluation the following changes should be made to Tables 15.3 and 15.7. The RSL for 1,2,3-trichloropropane should be listed as 18 micrograms per kilogram (µg/kg) instead of 91 µg/kg on Table 15.3, and the RSL for lead should be listed as 150 milligrams per kilogram (mg/kg) instead of 400 mg/kg on Table 15.7. The reference for this information can be found at the following link: http://www.dtsc.ca.gov/AssessingRisk/upload/HHRA-Note-3.pdf	The suggested revisions have been made.
6	--	Appendix A, SAP Worksheet #18.1 – Sampling Locations, Methods, and SOP Requirements Table for Pre-Excavation Soil Gas Sampling. a. GSU disagrees that one soil gas sample collected from a depth of 8 to 10 feet below ground surface (bgs) at each proposed location will be sufficient for the purposes of the remedy performance evaluation. GSU recommends that, in the Building 965 area, samples be collected from a depth of 4 to 6 feet bgs and 8 to 10 feet bgs, consistent with the May 2008 soil gas investigation. At the locations of PSG-1A-4 and PSG-1A-5, soil gas samples should be collected from a depth of 3 and 5 feet bgs, consistent with the previous NUSD soil gas sample depths. b. GSU does not consider the *Advisory – Active Soil Gas Investigations* (DTSC, 2003) to be a Standard Operating Procedure (SOP) for soil gas sampling. The intent of the advisory is to provide soil gas probe installation and sampling guidance. Please provide a detailed SOP for soil gas probe installation and soil vapor sampling.	a. Following removal of pavement, the Navy will collect pre-excavation soil gas samples to evaluate site conditions prior to removal of the VOC source area. The sampling depths for the pre-excavation samples have been revised and are presented in Table 18.1 of Appendix A. These samples are to be collected from discrete depths between 4 and 6 feet bgs. Sample depths will be selected to correlate with the closest existing sample where elevated concentrations of VOCs were previously identified. The pre-excavation samples are intended to address areas that were not previously sampled (e.g., areas beneath the buildings that were inaccessible) or areas where previous soil gas sampling data were inconsistent. One sampling depth at the shallow interval was deemed appropriate for pre-excavation samples, since they are intended to show a "worst-case" scenario (focusing on the depths most likely to contain elevated concentrations of VOCs). Post-excavation sampling will be used to fully evaluate the effectiveness of the removal action.

Table E1. Responses to Comments from Department of Toxic Substances Control (DTSC) on the Draft Removal Action Work Plan, Non-Time-Critical Removal Action for the Building 965 Area, Former Department of Defense Housing Facility, Novato, California, August 2009

Comment #	Section	Comment	Response
6 *(cont.)*	--	Appendix A, SAP Worksheet #18.1 – Sampling Locations, Methods, and SOP Requirements Table for Pre-Excavation Soil Gas Sampling. a. GSU disagrees that one soil gas sample collected from a depth of 8 to 10 feet below ground surface (bgs) at each proposed location will be sufficient for the purposes of the remedy performance evaluation. GSU recommends that, in the Building 965 area, samples be collected from a depth of 4 to 6 feet bgs and 8 to 10 feet bgs, consistent with the May 2008 soil gas investigation. At the locations of PSG-1A-4 and PSG-1A-5, soil gas samples should be collected from a depth of 3 and 5 feet bgs, consistent with the previous NUSD soil gas sample depths. b. GSU does not consider the *Advisory – Active Soil Gas Investigations* (DTSC, 2003) to be a Standard Operating Procedure (SOP) for soil gas sampling. The intent of the advisory is to provide soil gas probe installation and sampling guidance. Please provide a detailed SOP for soil gas probe installation and soil vapor sampling.	The sampling depths for the post-excavation samples have been revised and are presented in Table 5 of the RAWP, as well as Table 18.2 of Appendix A. These samples are being collected from two depth intervals that are consistent the depth intervals for samples collected in May 2008. Pre-excavation sampling within the 8 to 10 feet bgs range is not considered necessary because past results have shown that the highest concentrations are present in the upper 4 to 6 feet bgs range. Ultimately, the soil gas data will be used to evaluate the effectiveness of the removal action and to quantitatively assess potential risks to human health, in accordance with the approach outlined in the Risk Assessment White Paper (Battelle, 2009). If concentrations of VOCs in soil gas collected from these locations pose unacceptable risk to future site users, the Navy will evaluate appropriate contingency actions to address this risk (e.g., additional data collection, installation of an SVE system, or institutional controls). The depths of the pre-excavation soil gas samples were revised to reflect collection from shallow soil gas. b. A SOP for soil gas sampling has been added to Attachment A and is included with these responses to comments for informational purposes.
7	--	Appendix A, SAP Worksheet #18.2 – Sampling Locations, Methods, and SOP Requirements Table for Excavation Soil Sampling. The reference SOP does not provide sufficient detail with respect to the methods that will be used to collect undisturbed soil samples from the sidewalls and bottom of the excavation or composite samples from the stockpiled soil. Please provide a detailed SOP that includes the soil sampling methodology for both types of sampling.	Undisturbed soil confirmation samples will be collected from the excavator bucket using an EnCore® sampler (see EnCore® sampling SOP in Attachment A). A SOP for soil confirmation sampling from an excavator has been added to Attachment A and is included with these responses to comments for informational purposes. The text of the RAWP has been clarified regarding stockpile sampling to indicate samples of soil excavated and stockpiled for off-site disposal will be collected as a four-point composite sample for every 500 cubic yards (see Section 6.1 of the RAWP).

Table E1. Responses to Comments from Department of Toxic Substances Control (DTSC) on the Draft Removal Action Work Plan, Non-Time-Critical Removal Action for the Building 965 Area, Former Department of Defense Housing Facility, Novato, California, August 2009

Comment #	Section	Comment	Response
7 *(cont.)*	--	Appendix A, SAP Worksheet #18.2 – Sampling Locations, Methods, and SOP Requirements Table for Excavation Soil Sampling. The reference SOP does not provide sufficient detail with respect to the methods that will be used to collect undisturbed soil samples from the sidewalls and bottom of the excavation or composite samples from the stockpiled soil. Please provide a detailed SOP that includes the soil sampling methodology for both types of sampling.	Soil over-excavated to achieve the cut-back slopes will be stockpiled separately from the soil excavated beneath the pad and will be analyzed for VOCs for potential reuse as backfill material (one discrete sample per 100 cubic yards). Analytical results will be compared with EPA Region 9 RSLs for residential soil to determine whether VOCs are present in soil at unacceptable levels. Soil sampling procedures for stockpiled soil for potential use as backfill will comply with the requirements for soil confirmation sampling outlined in the SAP (Appendix A). If stockpiled soil from the slope cut areas contains contamination or is structurally unsuitable it will be disposed of off site.
8	--	Appendix A, SAP Worksheet #18.3 – Sampling Locations, Methods, and SOP Requirements Table for Post-Excavation Confirmation Soil Gas Sampling. a. GSU disagrees that one soil gas sample collected from a depth of 8 to 10 feet bgs will be sufficient for the purposes of the remedy performance evaluation. GSU recommends that samples be collected from a depth of 4 to 6 feet bgs and 8 to 10 feet bgs, consistent with the May 2008 soil gas investigation. b. GSU does not consider the *Advisory – Active Soil Gas Investigations* (DTSC, 2003) to be a SOP for soil gas sampling. The intent of the advisory is to provide soil gas sampling guidance. Please provide a detailed SOP for soil gas probe installation and soil vapor sampling.	a. The Navy agrees that soil gas post-excavation samples should be collected from locations and depths that mimic the depth intervals for samples collected in May 2008. Worksheet #18.3 has been revised, as has Table 5 of the RAWP (see response to comment 6A), to indicate that samples will be collected from shallow (4-6 feet bgs) and deep (8-10 feet bgs) depth intervals that are consistent with the May 2008 sample locations. Step 7 of Table 11-1 and Worksheets #17 and #27 in Appendix A have also been revised to reflect these changes. Finally, Figures 5 and 9 have been revised to reflect these changes and are included with these responses for informational purposes. b. A SOP for soil gas sampling has been added to Attachment A and is included with these responses to comments for informational purposes.
9	--	Appendix B – Field Forms. Additional field forms that should be provided include a soil gas probe installation log, a soil vapor sample collection log, and a field instrument calibration log.	The additional forms have been included in Appendix B, as requested

Table E2. Additional Revision made to the Draft Removal Action Work Plan, Non-Time-Critical Removal Action for the Building 965 Area, Former Department of Defense Housing Facility, Novato, California, August 2009

Additional Revision made to clarify text related to anticipated concentrations of VOCs following pavement removal

Comment #	Section	Revision
N/A	**5.2**	The text of the fifth paragraph of Section 5.2 has been clarified, as follows: *"It is not anticipated that project work activities will produce a volume of VOCs that would affect outdoor air and require action. BAAQMD Regulation 2 Permit, Rule 5 (Appendix D) provides for the review of new sources of toxic air contaminant (TAC) emissions to evaluate potential exposure of the public and to mitigate potentially significant health risks resulting from these exposures. An exemption to the provisions of this rule is provided for sources where the increase in each TAC emission is below a contaminant-specific acute trigger level, which represents an air concentration that is not likely to cause adverse effects to human health. In 2008, Battelle used this rule, along with the potential TACs at the site, to establish contaminant-specific acute trigger levels and evaluate the applicability of the BAAQMD Regulation 2 Permit Rule 5 (Battelle, 2008). The following assumptions were made in calculating the acute trigger levels:* ▪ *Soil excavation volume: 800 cubic meters* ▪ *All soil will be excavated in 1 hour (this is overly conservative, given that the proposed excavation will last for several days)* ▪ *All of the soil gas contained within the excavated soil will be released during excavation* ▪ *A soil-air porosity of 0.5* *The calculated emission rates (presented in Appendix D), based on these conservative assumptions, are several orders of magnitude below the BAAQMD acute trigger levels. This calculation indicates that the mass of soil gas present in the subsurface is not significant enough to result in emissions to the air at levels that would result in health risks to site workers or nearby residents."*

Table E3. Responses to Comments from San Francisco Bay Regional Water Quality Control Board (SFRWQCB) on the Draft Removal Action Work Plan, Non-Time-Critical Removal Action for the Building 965 Area, Former Department of Defense Housing Facility, Novato, California, August 2009

Comment #	Section	Comment	Response
Comments provided by SFRWQCB (Paisha Jorgensen, PG), dated August 26, 2009			
General Comments			
1	2.2	Section 2.2 of the Remedial Action Work Plan (RAW) indicates that the deeper soil in the Building 965 Area "are observed to be relatively impermeable, indicating it is unlikely that a significant volatile organic compound (VOC) mass is present in deeper soil gas." In Appendix A, the Sampling and Analysis Plan Worksheets #18.1 and #18.3 indicate that the pre- and post-excavation soil gas samples will be collected at a depth of 8 to 10 feet below ground surface in the relatively impermeable, deeper soil where significant VOC mass is unlikely. An effort should be made to collect soil gas data that will be useful in evaluating the performance of the Non-Time Critical Removal Action, filling data gaps, and comparing to Novato Unified School District soil gas samples. To accomplish this, please collect soil gas samples a *[sic]* multiple depths consistent with the May 2008 soil gas investigation.	The sampling depths for the pre-excavation samples have been revised and are presented in Table 18.1 of Appendix A. These samples are to be collected from depths between 4 and 6 feet bgs. The pre-excavation samples are intended to address areas that were not previously sampled (e.g., areas beneath the buildings that were inaccessible) or areas where previous soil gas sampling data were inconsistent. The sampling depth intervals and locations for the post-excavation samples have been revised to be consistent with the May 2008 sample locations and depths and are presented in Table 5 of the RAWP, as well as Table 18.2 of Appendix A. Please also see responses to DTSC comments 6 and 8.
2	--	A detailed Standard Operating Procedure (SOP) for soil gas sampling should be included in the RAW. The SOP should include, but not limited to, the following: • Monitoring probe construction, • Purge volumes and leak tests • Flow rates (flow controllers)	A SOP for soil gas sampling has been added to the SAP and is included with these responses to comments for informational purposes
Specific Comments			
1	--	**Appendix A, Worksheet #19, Page 65 –** Detected VOC concentrations can decrease significantly with increase sample size. Unless the laboratory method specifies using 6-liter Summa canisters, the Water Board suggests using 1 liter Summa canisters for sample collection.	The Navy agrees that the suggested 1-liter Summa canister size is more appropriate for shallow soil gas sampling and has revised the SAP accordingly.
2	--	**Appendix A, Worksheet #23, Page 71 –** It appears that either the header text is erroneous or this page in *[sic]* not meant to be in this report.	This page has been corrected.