COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY (CLEAN II)
Northern and Central California, Nevada, and Utah
Contract No. N62474-94-D-7609
Contract Task Order 324

Prepared for

DEPARTMENT OF THE NAVY
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Engineering Field Activity West
Naval Facilities Engineering Command
Daly City, California

DRAFT ADDENDUM
SAMPLING AND ANALYSIS PLAN
(FIELD SAMPLING PLAN AND
QUALITY ASSURANCE PROJECT PLAN)
SOIL GAS INVESTIGATION AT SWMU SITES 1, 2, 5, 7, AND 18
AN ADDENDUM TO THE DRAFT FINAL FIELD SAMPLING PLAN AND QUALITY ASSURANCE PROJECT PLAN REMEDIAL INVESTIGATION OF GROUNDWATER AT SWMU SITES 1, 2, 5, 7, AND 18
NAVAL WEAPONS STATION SEAL BEACH DETACHMENT CONCORD
CONCORD, CALIFORNIA

DS.0324.17817

June 6, 2003

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REVIEW AND APPROVALS

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Navy QA Officer: ______________________________ Date: ___________________
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ACRONYMS AND ABBREVIATIONS

bgs	Below ground surface
DQO	Data quality objective
EPA	U.S. Environmental Protection Agency
FS	Feasibility study
FSP	Field sampling plan
GSA	General Services Administration
HLA	Harding Lawson Associates
IAS	Initial assessment study
MCL	Maximum contaminant level
μg/L	Micrograms per liter
mg/kg	Milligrams per kilogram
Navy	U.S. Department of the Navy
NWSSBD	Naval Weapons Station Seal Beach Detachment
PRG	Preliminary Remediation Goals
QAPP	Quality assurance project plan
RCRA	Resource Conservation and Recovery Act
RFA	Recourse Conservation and Recovery Act facility assessment
RI	Remedial investigation
ROD	Record of decision
RWQCB	California Regional Water Quality Control Board
SI	Site investigation
SVOC	Semivolatile organic compound
SWMU	Solid Waste Management Unit
Tetra Tech	Tetra Tech EM Inc.
TPH	Total petroleum hydrocarbons
UST	Underground storage tank
VOC	Volatile organic compound

1.0 INTRODUCTION

Tetra Tech EM Inc. (Tetra Tech) is submitting this addendum to the “Draft Final Field Sampling Plan Remedial Investigation for Groundwater at Solid Waste Management Unit (SWMU) Sites 1, 2, 5, 7, and 18” (Tetra Tech 2001a) (hereinafter referred to as the FSP) and the “Draft Final Quality Assurance Project Plan Remedial Investigation for Groundwater at SWMU Sites 1, 2, 5, 7, and 18” (Tetra Tech 2001b) (hereinafter referred to as the QAPP). This addendum supports additional investigation of the source of volatile organic compounds (VOC) in groundwater at SWMU Sites 1, 2, 5, 7, and 18 at Naval Weapons Station, Seal Beach Detachment Concord (NWSSBD), in Concord, California. The draft final FSP and QAPP were approved as separate documents by the Navy Quality Assurance Officer on December 4, 2000. This addendum provides necessary elements in an integrated format to update both documents.

This addendum describes proposed field activities at SWMU Sites 1, 2, 5, 7, and 18, and includes the collection of soil gas samples for VOC analysis.

1.1 PURPOSE OF THE INVESTIGATION

Previous soil and groundwater investigations at SWMU Sites 1, 2, 5, 7, and 18 did not identify a possible source of VOC contamination in groundwater. The Navy proposes a soil gas survey to facilitate identification of a possible source.

1.2 PREVIOUS INVESTIGATIONS

The following sections describe previous investigations at SWMUs 1, 2, 5, 7, and 18.

1.2.1 Previous Investigations at SWMUs 1, 2, 5, 7, and 18

The DTSC performed a Resource Conservation and Recovery Act (RCRA) facility assessment (RFA) at Naval Weapons Station SBD Concord in June 1992 (DTSC 1992). The RFA was performed to evaluate the potential for release of hazardous substances from 49 SWMUs. In 1996, the Navy performed a RFA confirmation study (RFACS) to further evaluate the RFA findings. The RFACS included collection of soil, surface water, groundwater, and septic tank samples; laboratory analysis of the samples; and evaluation of the analytical results. Recommendations resulting from the RFACS included the transfer of TPH impacted sites to the Navy’s UST program designed to address the petroleum hydrocarbon contamination. Sites where low levels of VOCs were detected were recommended for evaluation under the CERCLA Installation Restoration Program. Results from these investigations are presented in the original FSP and QAPP.

1.2.2 Analytical Results

The following sections discuss the analytical results of the most recent soil and groundwater sampling for the RI activities proposed in the original FSP and QAPP and conducted in February and March. The soil sample depths ranged from approximately 2 to 14 feet bgs. Soil and groundwater samples were analyzed for VOCs (EPA method 8260B) and natural attenuation parameters (EPA Method 300.0), and metals (EPA Method 200.7).

PCE and TCE are the VOCs with the highest detectable concentrations at the Site and are, therefore, the primary focus of the discussion regarding VOC analytical results presented. Additionally, cis and trans 1,2-DCE, which often develop as a result of the degradation of PCE and TCE, are included in the discussion of analytical results for VOCs.

Analytical results for VOCs in soil and groundwater are summarized in Section 1.3.2.1 and 1.3.2.2, respectively. Concentrations below the laboratory method reporting limit are estimated concentrations and are distinguished in tables and figures with a “J” after the respective value. When discussing these values in text they are referred to as estimated values.

1.2.2.1 Soil Sample Results

A total of 158 soil samples collected from 39 different locations were analyzed for VOCs. Detectable concentrations of VOCs were reported in 2 of 158 soil samples submitted for analysis.

VOC constituents were not detected above screening criteria in any of the soil samples. TCE and PCE were detected in the sample collected at 28 feet bgs from soil boring SB018 at estimated concentrations of 0.002 mg/kg and 0.001 mg/kg, respectively. SB018 is located at the western end of the locomotive steam-cleaning area (Building 269). TCE was detected in the sample collected at 6 feet bgs from soil boring SB024 at an estimated concentration of 0.0006 mg/kg. SB024 is located near the southwest corner of Building IA-12. The concentrations reported for these samples are near the laboratory method detection limit and are estimated.

The soil-sampling program implemented for the RI was designed to supplement the soil investigation conducted during the RFACS and fill data gaps. Soil sampling locations selected for the RFACS and the

RI were targeted to investigate potential sources of VOCs, which have been detected in groundwater at the Site. Based on the results of the soil investigation described previously and the RFACS soil investigation conducted in 1996, it appears that VOCs have not significantly impacted soil at the Site.

1.2.2.2 Groundwater Sample Results

Because the primary focus of the RI is to determine the nature and extent of potentially impacted groundwater and to identify potential source areas of contaminant release, the two groundwater sample types (grab groundwater and monitoring well samples) are presented together in the following discussion. Although the analytical results for these samples are considered of similar data quality, the data may not be comparable. This is because grab groundwater samples are sometimes biased towards higher constituent concentrations as a result of sample turbidity and the tendency of constituents to adsorb to suspended soils in grab groundwater samples.

Samples were collected from 14 existing groundwater monitoring wells and 32 grab groundwater sample locations. In total, 48 samples were collected and analyzed for VOCs.

PCE, TCE, and cis and trans 1,2-DCE were detected in samples collected from 10 monitoring wells and from 21 grab groundwater sampling locations. PCE and TCE were generally detected at relatively higher concentrations than cis and trans 1,2-DCE.

The highest concentration of PCE detected at the site (102 μg/L) was collected from well MW-10 located downgradient of Building 269. The second highest concentration of PCE detected in groundwater (86 μg/L) was in boring SB024 located downgradient of Building IA-12. PCE was generally detected in groundwater at concentrations between 30 and 50 μg/L at locations in the immediate area of the highest detects downgradient from MW-10 and SB024. Relatively low concentrations of PCE were detected in samples collected from sampling locations in SMWU 2, located south of Kinne Boulevard. PCE was not detected in samples collected from locations upgradient of SWMU 5.

Evaluation of the VOC data indicates that PCE concentrations attenuate rapidly with distance from MW-10. Boring SB009 is located about 50 feet from MW-10 in a downgradient direction. The concentration of PCE at SB009 was 43 μg/L, down from 103 μg/L at MW-10. Boring SB004 is approximately 300 feet downgradient from MW-10. At location, the groundwater concentration of PCE was 33 μg/L. Approximately 600 feet downgradient from Well MW-10 PCE in groundwater was measured at a concentration of 5.1 μg/L in MW-2. The monitoring well farthest to the west is MW-14. Well MW-14 is located approximately 1200 feet from MW-10 and the detected concentration of PCE in groundwater at MW-14 was 2.6 μg/L.

For relative evaluation purposes, the PCE concentrations presented 16 are divided into four general categories, presented below:

PCE Concentration Range	**Number of Samples**
Not Detected	22
Less Than 5 μg/L	11
5 μg/L to 10 μg/L	6
10 μg/L and above	6

Most of the nondetected concentrations are located in upgradient areas. The upgradient samples are useful for determining that upgradient sources are not present. Samples located at the investigation boundaries were either nondetected for PCE or at concentrations of less than 5 μg/L.

The distribution of TCE was similar to that of PCE within SWMU 5 except the detected concentrations were generally lower. The maximum concentration of TCE in groundwater at the site was detected in soil boring SB024 at a concentration of 38 μg/L. SB024 is located near the west corner and downgradient of Building IA-12 (SB024 is the same location where the second highest concentration of PCE was detected). The second highest concentration of TCE was located MW-10 downgradient from Building 269 (MW-10 is the location where the highest concentration of PCE was detected in groundwater). TCE was not detected in samples collected from locations in SMWU 2 but was detected at low or estimated concentrations between 0.9 and 2.1 μg/L from samples collected from locations upgradient of SWMU 5.

For relative evaluation purposes, the TCE concentrations are divided into four general categories, presented below:

TCE Concentration Range	Number of Samples
Not Detected	22
Less Than 5 µg/L	17
5 µg/L to 10 µg/L	0
10 µg/L and above	6

Cis 1,2-DCE was detected in samples collected from nine locations at concentrations between an estimated concentration of 0.8 µg/L and a quantifiable concentration of 5.6 µg/L. Cis 1,2-DCE was only detected in samples collected from locations within SWMUs 5 and 7 and in downgradient sampling location SB004. Trans 1,2-DCE was detected in samples collected from seven sampling locations at concentrations ranging from an estimated concentration of 0.9 µg/L to a quantifiable concentration of 3.8 µg/L. Trans-1,2-DCE was also only detected in samples collected from locations within SWMUs 5 and 7 and in downgradient sampling location SB004.

The detected concentrations of VOCs in the samples presented previously were primarily associated with samples collected in SWMU 5 and 7 near Building 269. A hazardous waste storage area and steam-cleaning pad are located at Building 269, and a waste oil UST is located upgradient on the southern side of Building IA-12.

1.3 TECHNICAL OR REGULATORY STANDARDS

California Regional Water Quality Control Board Risk-Based Screening Levels (RBSL) will be used as the screening goals for this soil gas investigation (RWQCB 2001). These screening levels reflect the theoretical concentration of volatile chemicals immediately above contaminated soil and groundwater. Concentrations of VOCs in shallow soil gas above screening levels do not necessarily indicate that a significant threat to indoor air is present; only that additional evaluation may be warranted. The screening levels may be overly conservative for sites with low permeability soils immediately under buildings or sites with limited soil impact and no groundwater source of VOCs (RWQCB 2001). The RBSLs are presented in Table 3.

1.4 PROJECT ORGANIZATION

Table 1 presents the responsibilities and contact information for key personnel involved in the soil gas investigation. In some cases, more than one responsibility has been assigned to one person.

2.0 PROJECT AND TASK DESCRIPTION

The following subsections discuss the project objectives and project measurements for the soil gas sampling event.

2.1 PROJECT OBJECTIVES

As stated in Section 1.1, the primary objective of the soil gas sampling is to obtain additional information to assess impact of possible VOC contamination in soil to groundwater

To meet these objectives, the following field activities will be carried out:

- Collect soil gas samples from 53 locations for VOC analysis.
- If analytical results exceed the RBSLs additional step-out sampling will be proposed.

2.2 PROJECT MEASUREMENTS

Fifty-three shallow soil gas samples will be collected at the site (Figure 1) to investigate possible sources of previously detected VOC contamination in groundwater. Table 2 summarizes the analytical program.

Samples will be shipped to an off-site laboratory for analysis. Analytical results for soil gas samples will be compiled and used to assess the impacts of possible VOC contamination. Table 3 presents the project-required reporting limits and compares these limits to applicable screening criteria. Table 4 presents the laboratory precision and accuracy goals, and Table 5 presents analytical methods, containers, preservatives, and holding times for soil gas samples collected at the Site. Table 6 presents field QC samples.

2.2.1 Sampling Process Design

Shallow soil gas samples will be collected from a depth of 5-feet bgs. Sample locations were determined using a 20-foot grid system. Although sample locations were biased towards areas where VOCs were previously detected in groundwater, other areas of the site are also included in this investigation. Sample locations nearest locations where VOCs were detected previously in groundwater, shallow soil gas samples will be collected from a grid with 20-foot centers. In areas just outside of these locations, shallow soil gas samples will be collected from a grid with 40-foot centers. Figure 1 presents the proposed sampling locations. Samples will be analyzed for VOCs by EPA Method TO-15.

2.2.2 Sampling Methods

A direct-push sampling probe will be used to obtain soil gas samples from a depth of about 5 feet below ground surface (bgs). The following section describes the procedure for collection of soil gas samples.

2.2.3 Collection and Handling of Soil Gas Samples

Soil gas samples will be collected following the methods described in this addendum and in Tetra Tech's standard operating procedure (SOP) 074 for soil gas sampling methods (see Appendix A). Soil gas samples will be collected using a direct-push probe with a slotted screen-point sampling tip. The direct-push probe consists of 3-foot sections of 1.5-inch-diameter, hollow, tubular steel rods connected by threads. The tip section contains a smaller section of rod that is slotted to allow soil gas to enter. A bulkhead union at the top of the slotted rod accommodates the connection of Tygon tubing that runs from the tip section through the steel rods to the ground surface, where the soil gas samples will be collected. During installation of the probe, hydrated bentonite will be used to seal around the drive rod at ground surface to prevent ambient air intrusion. The inner soil gas pathway from probe tip to the surface should be continuously sealed.

When borings are advanced, the slotted-rod section is covered by the outer drive casing and is protected by a pointed metal drive tip. The probe is advanced through the soil using hydraulic, vibratory, or percussive force. The probe is advanced to the sampling interval (5 feet bgs), and the outer casing is pulled back about 18 inches, exposing the slotted sampling tip to the surrounding soil.

A sampling pump fitted with a particulate prefilter, a flow controller, and a combination vacuum and pressure gauge will be used to purge soil gas from the probe. Before the SUMMA canister is attached to the sampling pump, 3 to 5 volumes of soil gas, or as much as can be removed during a minimum of 3 to 5 minutes of pumping at 100 to 200 milliliters per minute, will be purged from the sampling apparatus. Before the pump is turned off, about 2 inches of the sampling line nearest the entrance port of the pump will be folded over and clamped to prevent ambient air from entering the system. After disconnect from the pump a flow regulator will be placed between the probe and the SUMMA canister to ensure the SUMMA canister is filled at the specified flow rate. The samples will be collected in 6-liter SUMMA canisters. The entrance end of the purged Tygon tubing is connected to the SUMMA canister. The pressure valve on the SUMMA canister is opened, which allows the evacuated canister to draw in soil gas until the canister reaches ambient pressure. When the canister shows that ambient pressure has been reached, close the sampling valve and remove the canister from the sampling line. If less than 0.25 liter is collected after 4 minutes, raise the soil gas probe 0.5 foot, and continue the process for another minute. If the minimum soil gas is not collected, repeat the procedure again. If the minimum required volume of soil gas is still not collected, abandon the process, and record the conducted steps in the field log book. After successfully collecting the soil gas sample the SUMMA canister is labeled with a sample tag attached to the handle of the canister. The label information will be then recorded in the field book and chain of custody.

2.2.4 Analytical Methods

Soil gas sample will be analyzed for VOC following EPA Method TO-15. EPA Method TO-15 involves full-scan gas chromatography/mass spectroscopy (GC/MS) analysis for VOCs in whole air samples collected in evacuated stainless-steel canisters. An aliquot of sample is withdrawn from the canister through a mass flow controller and either cryofocused by liquid argon or concentrated using a multisorbent bed. The focused air is then flash-heated through a hydrophobic drying system that removes water from the sample stream prior to analysis by full-scan GC/MS.

2.3 FIELD QUALITY CONTROL SAMPLES

One duplicate sample will be analyzed for every 10 samples collected during this investigation. Duplicate soil gas samples are collected using a “Y” splitter attached to two separate 6-liter SUMMA canisters. Duplicates are assigned non-descript sample identification numbers and are submitted blindly to the laboratory.

3.0 QUALITY OBJECTIVES AND CRITERIA FOR MEASUREMENT DATA

Table 7 presents the data quality objectives (DQO) identified for the soil gas investigation.

The DQO process is iterative, and the sampling design may be optimized as data are collected and evaluated. Existing soil data are insufficient to evaluate the extent of possible TCE and PCE contamination.

4.0 SECTIONS NOT REVISED

All other sections of the draft final FSP and QAPP (Tetra Tech 2001a, 2001b), as approved by the Navy in December 2000, remain in effect and are applicable for this field event at NWSSBD Concord.

REFERENCES

San Francisco Bay Regional Water Quality Control Board (RWQCB). 2001. "Application of Risk-Based Screening Levels and Decision Making to Sites with Impacted Soil and Groundwater." December.

Tetra Tech EM Inc (Tetra Tech). 2001a. "Draft Final Field Sampling Plan Remedial Investigation for Groundwater SWMU Sites 1, 2, 5, 7, and 18, Naval Weapons Station Seal Beach Detachment Concord, Concord, California." January 23.

Tetra Tech. 2001b. "Draft Final Quality Assurance Project Plan Remedial Investigation for Groundwater SWMU Sites 1, 2, 5, 7, and 18, Naval Weapons Station Seal Beach Detachment Concord, Concord, California." January 23.

FIGURE

Figure 1

This detailed station map has been deleted from the Internet-accessible version of this document as per Department of the Navy Internet security regulations.

TABLES

TABLE 1: KEY PERSONNEL

Soil Gas Investigation at SWMU Sites 1, 2, 5, 7, and 18, NWSSBD Concord

Name	Organization	Role	Responsibilities	Contact Information
Steven F. Tyahla	Navy	Remedial project manager	Responsible for overall project execution and for coordination with base representatives, regulatory agencies, and Navy management Actively participates in DQO process Provides management and technical oversight during data collection	Naval Facilities Engineering Command, Southwest Division (SWDIV), Daly City, CA TyahlaSF@efawest.navfac.navy.mil (650-746-7451)
Narciso A. Ancog	Navy	QA officer	Responsible for QA issues for all SWDIV environmental work Provides government oversight of Tetra Tech's QA program Reviews and approves SAP and any significant modifications Has authority to suspend project activities if Navy quality requirements are not met	Naval Facilities Engineering Command, SWDIV, San Diego, CA ancogna@efdsw.navfac.navy.mil (619) 532-2540
Joanna Canepa	Tetra Tech	Installation coordinator	Responsible for ensuring that all Tetra Tech activities at this installation are carried out in accordance with current Navy requirements	Tetra Tech, San Francisco, CA Joanna.Canepa@ttemi.com (415) 222-8295
Greg Swanson	Tetra Tech	Program QA manager	Responsible for regular discussion and resolution of QA issues with Navy QA officer Provides program-level QA guidance to installation coordinator, project manager, and project teams Reviews and approves SAPs Identifies nonconformances through audits and other QA review activities and recommends corrective action	Tetra Tech, San Diego, CA Greg.Swanson@TtEMI.com (619) 525-7188
Ron Ohta	Tetra Tech	Project QA officer	Responsible for providing guidance to project teams that are preparing SAPs Verifies that data collection methods specified in SAP comply with Navy and Tetra Tech requirements May conduct laboratory evaluations and audits	Tetra Tech, Sacramento, CA Ron.Ohta@TtEMI.com (916) 853-4506

TABLE 1: KEY PERSONNEL (Continued)

Soil Gas Investigation at SWMU Sites 1, 2, 5, 7, and 18, NWSSBD Concord

Name	Organization	Role	Responsibilities	Contact Information
To be determined	Tetra Tech	Field team leader	Responsible for directing day-to-day field activities conducted by Tetra Tech and subcontractor personnel Verifies that field sampling and measurement procedures follow SAP Provides project manager with regular reports on status of field activities	To be determined
To be determined	Tetra Tech	On-site safety officer	Responsible for implementing health and safety plan and for determining appropriate site control measures and personal protection levels Conducts safety briefings for Tetra Tech and subcontractor personnel and site visitors Can suspend operations that threaten health and safety	To be determined
Kevin Hoch	Tetra Tech	Chemist	Responsible for working with project team to define analytical requirements Assists in selecting a prequalified laboratory to complete required analyses (see Section 2.4 of SAP) Coordinates with laboratory project manager on analytical requirements, delivery schedules, and logistics Reviews laboratory data before they are released to project team	Tetra Tech, San Francisco, CA Kevin.Hoch@TtEMI.com (415) 222-8304
Wing Tse	Tetra Tech	Database manager	Responsible for developing, monitoring, and maintaining project database under guidance of project manager Works with analytical coordinator during preparation of SAP to resolve sample identification issues	Tetra Tech, San Francisco, CA Wing.Tse@TtEMI.com (415) 222-8326

TABLE 1: KEY PERSONNEL (Continued)
Soil Gas Investigation at SWMU Sites 1, 2, 5, 7, and 18, NWSSBD Concord

Name	Organization	Role	Responsibilities	Contact Information
To be determined	Laboratory	Project manager	Responsible for delivering analytical services that meet requirements of SAP Reviews SAP to understand analytical requirements Works with Tetra Tech analytical coordinator to confirm sample delivery schedules Reviews laboratory data package before it is delivered to Tetra Tech	To be determined
To be determined	Subcontractor	Project manager	Responsible for ensuring that subcontractor activities are conducted in accordance with requirements of SAP Coordinates subcontractor activities with Tetra Tech project manager or field team leader	To be determined

Notes:

DQO	Data quality objective
NWSSBD	Naval Weapons Station Seal Beach Detachment
QA	Quality assurance
RPM	Remedial project manager
SAP	Sampling and analysis plan
SWDIV	Naval Facilities Engineering Command, Southwest Division
Tetra Tech	Tetra Tech EM Inc.

TABLE 2: SUMMARY OF ANALYTICAL PROGRAM

Soil Gas Investigation at SWMU Sites 1, 2, 5, 7, and 18, NWSSBD Concord

Location Name	Analyses	Sample ID	Rationale
SG001 through SG053	Volatile organic compounds by EPA Method TO-15	324SG001 through 324SG053	To locate and delineate possible source of VOC contamination in groundwater
NA[a]	Volatile organic compounds by EPA Method TO-15	324SG054 through 324SG059	Field duplicate samples

Notes:

a Field duplicate samples will be assigned the same location name as the investigative sample, however they are assigned a distinct Sample ID.

NA Not applicable

VOC Volatile organic compounds

TABLE 3: COMPARISON OF PROJECT-REQUIRED REPORTING LIMITS AND SCREENING CRITERIA, VOLATILE ORGANIC COMPOUND ANALYSIS, METHOD TO-15

Soil Gas Investigation at SWMU Sites 1, 2, 5, 7, and 18, NWSSBD Concord

Analyte	RBSL (µg/m^3)[a]	PRRL (µg/m^3)	PRRL Below Screening Criteria?
1,1-Dichloroethene	330	2.0	Yes
cis-1,2-Dichloroethene	49,000	2.0	Yes
trans-1,2-Dichloroethene	100,000	2.0	Yes
Tetrachloroethene (PCE)	2,700	3.4	Yes
Trichloroethene (TCE)	8,000	2.7	Yes

Notes:

a RBSL for soil gas in shallow soils residential scenario

µg/m^3 Micrograms per cubic meter
PRRL Project-required detection limit
RBSL Risk-based screening level

TABLE 4: METHOD PRECISION AND ACCURACY GOALS VOLATILE ORGANIC COMPOUND ANALYSIS, METHOD TO-15

Soil Gas Investigation at SWMU Sites 1, 2, 5, 7, and 18, NWSSBD Concord

QC Check	Spike Compound	% Recovery
Surrogate	1,2-Dichloroethane-d_4	70 to 130
	Toluene-d_8	70 to 130
	4-Bromofluorobenzene	70 to 130
Internal Standard	Bromochloromethane	60 to 140
	1,4-Difluorobenzene	60 to 140
	Chlorobenzene-d_5	60 to 140
Laboratory Control Spike	1,1-Dichloroethene	70 to 130
	cis-1,2-Dichloroethene	70 to 130
	trans-1,2-Dichloroethene	70 to 130
	Tetrachloroethene (PCE)	70 to 130
	Trichloroethene (TCE)	70 to 130

TABLE 5: SAMPLE CONTAINER, HOLDING TIME, AND PRESERVATIVE REQUIREMENTS

Soil Gas Investigation at SWMU Sites 1, 2, 5, 7, and 18, NWSSBD Concord

Parameter	Method Number	Sample Container	Preservative	Holding Time
Volatile organic compounds	EPA TO-15	One – Six liter SUMMA canister	None	30 days

Note:

EPA U.S. Environmental Protection Agency

TABLE 6: FIELD QUALITY CONTROL SAMPLES

Soil Gas Investigation at SWMU Sites 1, 2, 5, 7, and 18, NWSSBD Concord

Sample Type	Frequency of Analysis	Matrix
Field Duplicate	10 percent	Air

TABLE 7: DATA QUALITY OBJECTIVES

Soil Gas Investigation at SWMU Sites 1, 2, 5, 7, and 18, NWSSBD Concord

STEP 1: State the Problem

TCE and PCE were detected in groundwater during previous investigations of the Site at concentrations exceeding the MCL. Soil sampling conducted in the area did not reveal a source for this groundwater contamination.

STEP 2: Identify the Decisions

Is a source of TCE or PCE contamination present in shallow soil at concentrations sufficient to impact groundwater in the vicinity of SWMU Sites 1, 2, 5, 7, and 18 and is this contamination at a concentration that poses an unacceptable risk to human health?

STEP 3: Identify Inputs to the Decisions

- Analytical results for TCE, PCE, and daughter products in shallow soil gas and soil at SWMU Sites 1, 2, 5, 7, and 18.
- Appropriate screening criteria including RBSLs.
- Review of historical information.
- Hydrogeologic information.

STEP 4: Define Study Boundaries

- The lateral extent of the study area is the area contained within Figure 1.
- The vertical extent of the shallow soil gas survey extends from the soil surface down to 5 feet bgs.
- Temporal boundaries extend through the period of performance of the task order.

STEP 5: Develop Decision Rules

If TCE or PCE are detected in shallow soil gas samples at concentrations exceeding the RBSL, then a focused soil investigation will be considered to delineate the possible source of contamination and whether the concentrations pose an unacceptable risk to human health. Otherwise, no further investigation will be required.

STEP 6: Specify Tolerable Limits on Decision Errors

Site-specific sampling objectives and the media being investigated limit the use of statistical methods in selecting sampling locations for this investigation. Sampling locations will be based on prior knowledge of site history and existing soil and groundwater data. Tolerable limits on decision errors cannot be precisely defined.

STEP 7: Optimize the Sampling Design

Sampling locations were selected based on site history; therefore, sampling locations are judgmentally placed. Step-out samples may be necessary if detects exceeding the RBSL are encountered.

Notes:

bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
MCL	Maximum contaminant level
PRG	Preliminary remediation goal
RBSL	Risk-based screening level

APPENDIX A

STANDARD OPERATING PROCEDURE 074: SOIL GAS SAMPLING METHODS