Quality Assurance Project Plan
Former Fort Ord, California
Volume I, Appendix C
Addendum No. 1
Soil Gas Monitoring at Sites 2 and 12

Prepared for:
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On behalf of:
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USACE Contract No. W91238-19-C-0027
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Title and Approval Page (Worksheet #1)

Site Name/Project Name: Sites 2 and 12 (2/12)

Site Location: Former Fort Ord, California

Document Title: Quality Assurance Project Plan, Former Fort Ord, California, Volume I, Appendix C, Addendum No. 1, Soil Gas Monitoring at Sites 2 and 12

Lead Organization: U.S. Army Corps of Engineers

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Preparation Date: September 17, 2019

Project Role	Name Organization	Signature	Date
Investigative Organization's Project Manager	Derek S. Lieberman Ahtna		
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Lead Organization's Technical Lead	Alex Kan USACE		
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Acronyms and Abbreviations

2/12	Sites 2 and 12
ACL	aquifer cleanup level
Ahtna	Ahtna Global, LLC
Army	U.S. Department of the Army
CCRWQCB	Central Coast Regional Water Quality Control Board
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	chemical of concern
DQO	data quality objectives
DTSC	Department of Toxic Substance Control
EPA	U.S. Environmental Protection Agency
ESD	Explanation of Significant Differences
FODIS	Fort Ord Data Integration System
LOQ	limit of quantitation
PCE	tetrachloroethene
PDB	passive diffusion bag
PQO	project quality objectives
QAPP	Quality Assurance Project Plan
QA	Quality Assurance
QC	Quality Control
QSM	Quality Systems Manual
RAO	remedial action objective
SGCL	soil gas cleanup level
SOP	standard operating procedure
SVE	soil vapor extraction
SVETS	Soil Vapor Extraction and Treatment System
TCE	trichloroethene
USACE	U.S. Army Corps of Engineers

1.0 Introduction

On behalf of the U.S. Army Corps of Engineers (USACE), Sacramento District, Ahtna Global, LLC (Ahtna) prepared this *Quality Assurance Project Plan, Former Fort Ord, California, Volume 1, Appendix C, Addendum No. 1, Soil Gas Monitoring at Sites 2 and 12* (QAPP Addendum)[1] under USACE Contract Number W91238-19-C-0027. The QAPP Addendum describes soil gas and groundwater sampling and analysis activities to be conducted during a rebound study associated with Sites 2 and 12 (2/12). This work is being conducted under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or "Superfund") to address historical releases of chemicals of concern (COCs) at the former Fort Ord. The QAPP Addendum includes:

- A description of sampling and analysis activities
- Tables and figures with the proposed sample locations
- A project schedule

This QAPP Addendum is the governing guidance document for the rebound soil gas sampling associated with Sites 2/12. The QAPP Addendum ensures the data generated are accurate, precise, complete, representative of field conditions, and of sufficient quality to support project decisions. This document is an addendum to the *Quality Assurance Project Plan, Former Fort Ord, California, Volume I, Appendix C, Final Revision 4, Soil Gas Monitoring at Sites 2 and 12* (Soil Gas QAPP Revision 4; AEI, 2019a) and provides additional project specific details. Reference to the main document will be made as appropriate and noted in the text. Groundwater sampling and analysis is addressed in the *Quality Assurance Project Plan, Former Fort Ord, California, Volume I, Appendix A, Final Revision 7, Groundwater Remedies and Monitoring at Operable Unit 2, Sites 2 and 12, and Operable Unit Carbon Tetrachloride Plume* (Groundwater QAPP Revision 7; AEI, 2019b). This QAPP Addendum only discusses groundwater at Sites 2/12 in the context of selection of sampling locations for the rebound study.

[1] This document is an addendum to Appendix C to the *Quality Assurance Project Plan, Superfund Response Actions, Former Fort Ord, California, Volume I*. Volume I is also the governing document for sampling and analysis of groundwater (Appendix A), soil (Appendix B), and landfill gas (Appendix D). Volume II of the QAPP pertains to the former Fort Ord military munitions response program.

2.0 PROJECT MANAGEMENT AND OBJECTIVES

2.1 QAPP Addendum Identifying Information (Worksheet #2)

Title: Quality Assurance Project Plan, Former Fort Ord, California, Volume I, Appendix C, Addendum No. 1, Soil Gas Monitoring at Sites 2 and 12

Revision Number: 0

Revision Date: September 17, 2019

Site name/project name: Soil Gas Monitoring at Sites 2 and 12, Former Fort Ord, California

Site location: Monterey County, California

Site number/code: 2/12

Operable Unit: Sites 2 and 12

Contractor name: Ahtna Global, LLC

Contract number: W91238-19-C-0027

Contract title: Fort Ord Groundwater Remediation and Landfill Operation and Maintenance

Work Assignment Number: N/A

Guidance used to prepare QAPP Addendum: Uniform Federal Policy for Quality Assurance Project Plans, Final, Version 1, March 2005

Regulatory program: CERCLA as amended by Superfund Amendment and Reauthorization Act

Approval entity: U.S. Environmental Protection Agency (EPA), California Department of Toxic Substance Control (DTSC), and California Regional Water Quality Control Board, Central Coast Region (CCRWQCB), collectively the "regulatory agencies."

Data users: U.S. Department of the Army (Army), USACE, EPA, DTSC, CCRWQCB, Army/USACE contractors, property owners, occupants and managers, and the public.

QAPP type: Generic _____ Project Specific **X**_____

Planning session date/s: September 12, 2019

Dates and titles of QAPP documents written for previous site work:

September 2013, Final Quality Assurance Project Plan/Field Sampling Plan, Remedial Investigation/Feasibility Study Addendum at Sites 2 and 12, Former Fort Ord, California (Appendix A to the RI/FS Addendum Work Plan, AR# BW-2665A)

March 2015, Quality Assurance Project Plan, Former Fort Ord, California, Volume I, Appendix C, Final Revision 0, Soil Gas Monitoring at Sites 2 and 12 (AR# BW-2727B)

March 2016, Quality Assurance Project Plan, Former Fort Ord, California, Volume I, Appendix C, Final Revision 1, Soil Gas Monitoring at Sites 2 and 12 (AR# BW-2792A)

May 2017, Quality Assurance Project Plan, Former Fort Ord, California, Volume I, Appendix C, Final Revision 2, Soil Gas Monitoring at Sites 2 and 12 (AR# BW-2792C)

January 2018, Quality Assurance Project Plan, Former Fort Ord, California, Volume I, Appendix C, Final Revision 3, Soil Gas Monitoring at Sites 2 and 12 (AR# BW-2792E)

February 2019, Quality Assurance Project Plan, Former Fort Ord, California, Volume I, Appendix C, Final Revision 4, Soil Gas Monitoring at Sites 2 and 12 (AR# BW-2792G)

Organizational partners (stakeholders) and connection with lead organization: USACE, Army (Lead Agency/Owner), EPA (Lead Oversight Agency), DTSC (Support Agency), CCRWQCB (Support Agency), Target Corporation (Property Owner), Marina Community Partners (Property Owner), and public participants.

2.2 Distribution List (Worksheet #3)

Information for this worksheet is included in Soil Gas QAPP Revision 4 (AEI, 2019a).

2.3 Project Personnel Sign-Off Sheet (Worksheet #4)

Copies of this form will be signed by key project personnel from each organization to indicate that they have read the applicable QAPP Addendum sections and will perform the tasks as described. Key project personnel include the lead organization, contractors, subcontractors, lead field personnel, Project Manager, Data Reviewer, assessment personnel, and laboratory Quality Assurance (QA) Manager. Supervisory or oversight personnel are responsible for communicating the requirements of the applicable portions of the QAPP Addendum to those performing the work. Each organization will forward signed sheets to Ahtna to be stored in the central project file.

Organization: Ahtna

Project Personnel	Title	Telephone	Signature
Chuck Holman	Program Manager	831-384-3735	
Derek Lieberman	Project Manager	831-384-3735	
Sylvester Kosowski	Task Lead, Soil Gas Remedy	831-384-3735	
Eric Schmidt	Project Chemist	831-384-3735	
Mark Fisler	Field Services Coordinator	831-384-3735	
Bruce Wilcer	Quality Control (QC) Manager	925-222-6595	

Project Personnel Sign-Off Sheet (Worksheet #4)

Organization: Eurofins (Ahtna Subcontractor)

Project Personnel	Title	Telephone	Signature
Melanie Levesque	QA Manager	916-605-3396	
Sepideh Saeed	Lab Director	916-605-3383	
Brian Whittaker	Project Manager	916-605-3355	

2.4 Project Organizational Chart (Worksheet #5)

Information for this worksheet is included in Soil Gas QAPP Revision 4 (AEI, 2019a).

2.5 Communication Pathways (Worksheet #6)

Information for this worksheet is included in Soil Gas QAPP Revision 4 (AEI, 2019a).

2.6 Personnel Responsibilities and Qualifications Table (Worksheet #7)

Information for this worksheet is included in Soil Gas QAPP Revision 4 (AEI, 2019a).

2.7 Special Training Requirements and Certification (Worksheet #8)

Information for this worksheet is included in Soil Gas QAPP Revision 4 (AEI, 2019a).

2.8 Project Planning Session Summary (Worksheet #9)

Project Name: Rebound Study Soil Gas Monitoring at Sites 2 and 12 **Start Date:** February 1, 2020 **Project Manager:** Derek Lieberman, Ahtna	**Site Name:** Sites 2 and 12 **Site Location:** Former Fort Ord, California
Date of Planning Session: September 12, 2019 **Planning Session Purpose:** Define data quality objectives (DQOs) and analytic approach criteria for the soil gas rebound study at Sites 2 and 12.	

Name	Title/Role	Affiliation	Telephone	email Address
Derek Lieberman	Project Manager	Ahtna	831-384-3735	dlieberman@ahtna.net
Sylvester Kosowski	Task Lead, Soil Gas Monitoring Program	Ahtna	831-384-3735	skosowski@ahtna.net
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Eric Schmidt	Project Chemist	Ahtna	831-384-3735	eschmidt@ahtna.net
Andrew Mauck	Field Technician	Ahtna	831-384-3735	amauck@ahtna.net

Planning Session Summary:

1) Reviewed contract requirements to determine QAPP Addendum scope;
2) Reviewed site maps along with current and historic soil gas and groundwater plume locations;
3) Assessed the project goals to optimize sampling locations;
4) Compared current groundwater and soil gas sampling with proposed rebound sampling; and
5) Determined the optimized sampling locations for both soil gas and groundwater.

Action Items:

Based on this review, Ahtna will:

- Initiate/Complete QAPP Addendum.
- Base selection of individual soil gas probes and groundwater monitoring wells on:
    - Existing and historic tetrachloroethene (PCE) soil gas plume footprints;
    - Existing and historic trichloroethene (TCE) soil gas plume footprints; and
    - Trend analysis for both PCE and TCE at individual soil gas probes and groundwater monitoring wells.

2.9 Problem Definition/Data Quality Objectives (Worksheet #10)

DQOs were applied to optimize and describe the data collection objectives for soil gas at Sites 2/12. The DQO process, as prescribed by the *Guidance on Systematic Planning using the Data Quality Objectives Process* (EPA, 2006), is divided into seven steps:

- State the problem
- Identify the decisions
- Identify inputs to the decisions
- Define study boundaries
- Develop the analytic approach
- Specify limits on decision errors
- Optimize study design

The seven steps of the DQO process as applied to each project are described in the following sections.

2.9.1 Problem Statement

Historical activities at Sites 2/12, including disposal of solvents at Site 12, resulted in releases of volatile organic compounds, primarily trichloroethene (TCE) and tetrachloroethene (PCE), into soil and groundwater. Groundwater remediation activities have been conducted since 1999 and have successfully reduced COC concentrations in groundwater at Sites 2/12. Soil gas was investigated at Site 12 in 2013 and distinct PCE and TCE plumes were identified in the vadose (or unsaturated) zone of the Upper 180-Foot Aquifer (AES, 2015).

Follow-up investigations and operation of a soil vapor extraction (SVE) and air sparge pilot study treatment system in 2014 identified a groundwater plume and soil gas plume of TCE in the southern Site 12 area (Figure 1). The pilot study demonstrated that SVE and AS are effective technologies for remediation of soil gas and groundwater at Site 12 (AES, 2015); however, it was determined SVE and additional groundwater extraction and treatment (instead of AS) would likely be more effective for achieving remedial action objectives as described in the Explanation of Significant Differences No. 1 (ESD No. 1; Army, 2016). Accordingly, a full-scale soil vapor extraction and treatment system (SVETS) and one additional groundwater extraction well were constructed per the *Final Remedial Action Work Plan Addendum, Sites 2 and 12 Groundwater Remediation, Former Fort Ord, California* (AEI, 2015).

The SVETS began operation in September 2015. Based on the results of quarterly soil gas and groundwater monitoring, SVE wells were operated to optimize the removal of COCs that might otherwise partition into groundwater. Operation of the SVETS reduced COCs in soil gas to concentrations below the soil gas cleanup levels (SGCLs) described in ESD No. 1 (Army, 2016). In February 2019, with the concurrence of the regulatory agencies, the SVETS was shut down to evaluate whether COCs were continuing to partition between soil gas and groundwater and whether concentrations of COCs in soil gas would remain below SGCLs (Army, 2019a). The operational history of the SVETS is summarized in Table 1. After two quarters of monitoring, no significant changes in COC concentrations were observed and the regulatory agencies concurred the SVETS could remain offline (Army, 2019b). However, concentrations of COCs in groundwater remain above aquifer cleanup levels

(ACLs); therefore, the goals of the rebound study are to 1) evaluate if COC concentrations have stabilized or are declining in both soil gas and groundwater with the SVETS offline, and 2) to confirm remedial action objectives (RAOs) for soil gas continue to be met with the SVETS offline.

Accordingly, further data collection is needed in the Sites 2/12 area to:

- Determine whether there is a rebound in concentrations of PCE and TCE in soil gas or groundwater by observing trends in concentrations from select sample points and depths; and
- Determine whether continued operation of the SVETS is required to remove COCs from soil gas that could adversely impact groundwater.

Project action limits for soil gas are also summarized in Soil Gas QAPP Revision 4, Worksheet #15 (AEI, 2019a).

2.9.2 Decision Identification

The primary decisions associated with the Sites 2/12 rebound study are whether:

- COC concentrations are stable with the SVETS offline; and
- RAOs have been achieved for soil gas COCs within the project boundary.

2.9.3 Decision Inputs

Inputs to decisions are as follows:

- COC concentrations in soil gas;
- COC concentrations in groundwater;
- SGCLs (Worksheet #15);
- Groundwater ACLs (identified in Groundwater QAPP Revision 7 Appendix A [AEI, 2019b] and ESD No. 1 [Army, 2016]);

2.9.4 Definition of Study Boundaries

The Sites 2/12 rebound study area is broadly defined by the retail development tracts east of State Route 1, south of Imjin Parkway, west of 2nd Avenue, and north of the former 10th Street (Figure 1). The rebound study focuses on the COC soil gas plume extents based on data collected in June 2014, prior to the start of SVETS operations (AEI, 2015). Soil gas samples will be collected from probes at specific depths (see Worksheet #18) to determine if COCs concentrations are below the SGCLs and are stable. Similarly, samples will be collected from monitoring wells at specific depths to determine if COC concentrations are stable in groundwater. Twelve soil gas probes and three groundwater monitoring wells will be sampled at Site 12 (Figure 1).

2.9.5 Development of the Analytic Approach

Soil gas probes and groundwater wells will be sampled for three consecutive quarters. At the end of this period, a determination will be made based on the data, in combination with historical data, whether COC concentrations are stable, increasing, or declining with the SVETS offline.

- If monitoring data show concentrations of COCs in a soil gas probe or groundwater well are less than or equal to their respective SGCLs or ACLs, and it can be demonstrated COC concentrations will continue to be less than or equal to SGCLs or ACLs in the future, then rebound is not occurring in the soil gas probe or groundwater well under any of the following conditions:
    - If all COCs in the soil gas probe or groundwater well are ND, or a combination of ND sampling results and all detected COC concentrations are below the SGCLs and ACLs, and sufficient data are available (i.e., a minimum of eight data points), then a statistical analysis of the data will be performed to confirm rebound is not occurring in the soil gas probe or groundwater well.
    - If monitoring data do not lend themselves to a statistical analysis (e.g., fewer than eight data points), then non-statistical review of the data set may be used.
    - If all COCs in the soil gas probe or groundwater well are less than or equal to their respective SGCLs or ACLs, and a statistical analysis (i.e., trend analysis) demonstrates COCs will remain less than or equal to SGCLs or ACLs in the future (the trend line has a statistically significant zero [steady state] or negative [decreasing] slope, and the 95% upper confidence limit (UCL) value is less than or equal to the SGCL or ACL), then rebound is not occurring in the soil gas probe or groundwater well.
- If the statistical analysis or non-statistical review demonstrates COC rebound is not occurring in soil gas at Sites 2/12, then:
    - The SVETS will remain offline and may be proposed for decommissioning.
    - The soil remedial unit will be proposed for closure in a remedial action completion report.
- If the statistical analysis or non-statistical review indicates an increasing COC concentration trend, then further monitoring may be conducted.
- If soil gas COC concentrations increase above SGCLs, then the SVETS will operated.
- If rebound study data indicate COCs are partitioning from groundwater into soil gas at concentrations greater than SGCLs, then the SVETS may be operated.
- If rebound study data indicate COCs are partitioning from soil gas into groundwater at concentrations greater than ACLs, then the SVETS may be operated.

2.9.6 Specification of Limits of Decision Errors

Because decisions pertaining to the rebound study will be based on sample collection and analysis, decision errors may result from the limitations of sampling or analytical techniques. To limit analytical errors, analytical method requirements have been established that include precision, accuracy and sensitivity goals that will produce data capable of supporting project decisions. To limit sampling errors, sample collection protocol specified in standard operating procedures (AEI, 2019a and 2019b) will be strictly followed and sufficient samples will be collected to support project decisions. Sample volume and preservation requirements will be followed as described in Soil Gas QAPP Revision 4 Worksheet #19 (AEI, 2019a) and Groundwater QAPP Revision 7 Worksheets #19 and #30 (AEI, 2019b).

False positive and false negative decision errors are defined in the context of hypothesis testing, where the terms are defined with respect to the null hypothesis. A false positive decision error occurs when the null hypothesis is rejected when it is true. A false negative decision occurs when the null hypothesis is not rejected when it is false. The null hypothesis is COC concentrations are stable or declining below the SGCL with the SVETS offline. Potential consequences of a false positive detection might include:

- Unnecessary operation of the SVETS when COC concentrations are stable and are lower than SGCLs;
- Continued monitoring when it is not necessary; and
- Delay in site closure.

The potential consequence of a false negative result is that COCs are not stable, remain in the soil gas at concentrations above the SGCLs, and are a continuing source of groundwater contamination.

Decision errors are most likely to occur when the measured concentration is near the SGCL, or in the case of non-detects, when the limit of quantitation (LOQ) is near the SGCL. To control decision errors when the LOQ is near the SGCL, the laboratory is required to report any detections below the LOQ (but above the limit of detection), thereby giving the data user additional information regarding trace level contamination. This may be the case when sample dilution raises the LOQ to a level near the cleanup level.

False negatives or positives could occur due to laboratory error, contamination, or dilution. False negatives or positives could occur if the soil gas sample is inadvertently collecting ambient air versus soil gas where ambient air contains low or high concentrations of COCs. All soil gas probes and soil gas sampling shroud assemblies are leak tested with helium and detectors in the field prior to sampling and ambient air contamination or dilution should be avoidable.

Definitive data are required for supporting project decisions. It is assumed that, if the precision, accuracy and sensitivity requirements specified in Soil Gas QAPP Revision 4 (AEI, 2019a) are met, the data will be usable for decision making purposes.

2.9.7 Optimization of the Design

The sampling approach is non-random and based on professional judgment. To limit uncertainty in obtained environmental data, criteria for the precision, accuracy, representativeness, completeness, comparability parameters and reporting limits for the parameters have been developed and are presented in Sections 3 through 5 of this QAPP Addendum. Measurement errors will be controlled by using the appropriate sampling and analytical methods, adhering to the requirements of Quality Systems Manual (QSM) Version 5.1 (DoD, 2017), and data validation/review to verify laboratory processes and measurement quality objectives. The data that meet these criteria will be of definitive quality.

2.10 Project Quality Objectives/Systematic Planning Process Statements (Worksheet #11)

Project quality objectives (PQOs), in terms of type, quantity, and quality of data determined using a systematic planning process, are described below. The PQOs in the form of qualitative and quantitative statements are provided.

2.10.1 Data Users

The data will be used by the USACE and its contractors, the regulatory agencies, property owners and occupants, citizen groups and members of the public.

2.10.2 Data Uses

The data collected will be used to determine whether concentrations of COCs are stable or declining since the SVETS has been offline. The data may also be used to determine whether continued operations of the SVETS are required.

2.10.3 Data Types

Analytical data are needed to make decisions. Analysis for project soil gas samples will include COCs by EPA Method TO-15. Analysis for project groundwater samples will include COCs by EPA 8260-SIM. Sample type and location-specific analytes are included in Soil Gas QAPP Revision 4 Worksheet #15 (AEI, 2019a) and Groundwater QAPP Revision 7 Worksheet #15 (AEI, 2019b).

2.10.4 Data Validation

Data review and validation is described in Soil Gas QAPP Revision 4 and Groundwater QAPP Revision 7 Worksheets #34 – #37.

2.10.5 Data Collection

The analytic approach identified in Worksheet #10 will follow the schedule provided in Worksheet #16. Sample collection procedures are provided in the standard operating procedures (SOPs) in Attachment A of Soil Gas QAPP Revision 4 (AEI, 2019a) and Groundwater QAPP Revision 7 (AEI, 2019b).

Soil gas probes will be purged of three probe volumes prior to sampling to ensure stagnant air is removed and a representative soil gas sample is collected from the desired sample location. The probe volume calculation methodology is depicted in Soil Gas QAPP Revision 4 Figure 4 and purge volumes for each soil gas probe are listed in Soil Gas QAPP Revision 4 Table 1 (AEI, 2019a). Soil gas probe purge volume calculations vary depending on tubing length, tubing diameter, borehole diameter, sand-pack thickness, and dry bentonite thickness. All Sites 2/12 soil gas probes were installed with 8-inch diameter boreholes, 0.19-inch inner diameter tubing, and varying thickness of dry bentonite (typically 0.5 feet) and sand-pack (typically 1.25 feet).

2.10.6 Data Collectors

Data for the project will be collected by Ahtna field staff or qualified subcontractors.

2.10.7 Reporting

Data from rebound study activities will be included in a Rebound Study Technical Memorandum submitted to project stakeholders.

2.10.8 Archiving

Paper copies of the reports will be submitted to the Fort Ord Administrative Record, USACE, and regulatory agencies. Electronic media (e.g., CD) or online storage (e.g., Portable Document Format [PDF]) will be used to permanently archive data and reports. Final reports will be archived in the Fort Ord Data Integration System (FODIS).

2.11 Measurement Performance Criteria Tables (Worksheet #12)

Information for this worksheet is included in Soil Gas QAPP Revision 4 (AEI, 2019a).

2.12 Secondary Data Criteria and Limitations (Worksheet #13)

Information for this worksheet is included in Soil Gas QAPP Revision 4 (AEI, 2019a).

2.13 Summary of Project Tasks (Worksheet #14)

Sampling Tasks:
1. Soil gas/groundwater as described in Worksheet #17
Analysis Tasks:
1. See Worksheet #15.
Quality Control Tasks:
1. Implement three phase QC process in Worksheet #31 to verify SOPs for collection of samples, packing and transport, and post field processing prior to analysis are being followed. Collect and submit QC samples as described in Worksheet #20. Analyses to be performed in accordance with this QAPP Addendum, the guidance provided in the published methods and analytical laboratory SOPs.
Secondary Data:
1. See Worksheet #13.
Data Management Tasks:
1. Analytical data from the laboratory for each sample will be tracked, reviewed, and loaded into the Ahtna database and the FODIS database. 2. Following receipt of analytical data packages, the data is validated and a qualifier file is created. The data qualifier file is verified against the hardcopy data validation reports at a rate of 10%. Once verified, the data qualifier file is loaded into the Ahtna database, the FODIS database, and validated data uploaded to the GeoTracker database for Sites 2/12 (Global ID: DOD100204800).
Documentation and Records:
1. Sampling methods, times, field measurements, observations, and assessments will be documented in field notes or sampling forms. Chain of custody forms and courier/transportation bills will be prepared and retained in project files for each sample. A copy of laboratory records will be included in the final report. PDF copies of all validated laboratory data and electronic data deliverables will be delivered to USACE.
Assessment/Audit Tasks:
1. Sampling activities will be evaluated for compliance with the applicable SOP by the Field Supervisor or Project Chemist. 2. Field and Laboratory audits may be performed by the Project or Program Chemist.
Data Review Tasks:
Following data review performed by the analytical laboratory, 100% of the sample results will be subject to the equivalent of EPA Stage 2B review and 10% will be subject to the equivalent of EPA Stage 4 raw data review as described in Worksheets #34 through #37. The review will assess compliance with the requirements of this QAPP Addendum, the guidance provided in the QSM Version 5.1 (DoD, 2017). The findings of the data review and validation will be used to assess the usability of the data for supporting project decisions, and to implement corrective actions with the laboratory, if appropriate. Data qualifiers will be applied to sample results as needed based on the findings of the data validation and uploaded with the analytical data to the Ahtna database, FODIS, and GeoTracker.

2.14 Reference Limits and Evaluation Table (Worksheet #15)

Information for this worksheet is included in Soil Gas QAPP Revision 4 (AEI, 2019a).

2.15 Project Schedule/Timeline (Worksheet #16)

Sampling for the rebound study will begin during the first quarter of 2020 and will last for three quarters. There is one deliverable associated with this soil gas rebound study. A soil gas Rebound Study Technical Memorandum will be issued 60 days after completion of the last sampling event of this task.

3.0 Measurement and Data Acquisition

3.1 Sampling Design/Rationale (Worksheet #17)

A total of 167 permanent soil gas probes were installed at Site 12 in 24 locations, with seven nested probes at 23 locations, and six nested probes at one location. The nested probes were installed at approximately 10-foot intervals from 10 feet bgs to a depth of approximately 70 feet bgs. The installed soil gas probe locations were selected to delineate the PCE and TCE soil gas plumes identified initially in 1992 (HLA, 1995) and expanded upon the initial soil gas investigations (USACE, 2013). Two nested probe locations (SG-12-10 and SG-12-21; 14 probes total) were decommissioned in 2016, and five other probes are no longer functional and cannot be sampled.

Nine groundwater monitoring wells are present at Sites 2/12 and within the June 2014 soil gas COC plume footprints. Three of these wells will be sampled as part of this rebound study (Figure 1).

Twelve soil gas probes were selected to best represent whether COC concentrations in soil gas are stable or declining since the SVETS has been offline. These probes are within the deepest unsaturated portion of the vadose zone in the area of the June 2014 soil gas COC plume footprints. Additionally, three groundwater well locations and depths were selected to best represent whether COC concentrations in groundwater are stable or declining. The groundwater sample locations are in the shallowest saturated passive diffusion bag (PDB) station in the well. Both soil gas probe and groundwater well vertical sampling locations may change during the rebound study dependent upon seasonal groundwater level variations.

Soil gas samples will be analyzed for TCE and PCE by EPA Method TO-15; groundwater samples will be analyzed for TCE and PCE by 8260-SIM. The sample analytical results will be assessed via the analytic approach in Worksheet #10.

Sampling locations are listed in Worksheet #18. The quarterly events also include 10% duplicate soil gas sampling.

3.2 Sampling Locations and Methods/SOP Requirements Table (Worksheet #18)

Soil Gas/Groundwater Probe/Well ID	Analytical Method for PCE & TCE	Matrix	Sampling Methods/SOPs[1]	Comments
SG-12-01-58[2]	TO-15 (5&20)[3]	Soil Gas	SUMMA®/SOPs 1-4 and 7	Rebound study sample
SG-12-01-65	TO-15 (5&20)	Soil Gas	SUMMA®/SOPs 1-4 and 7	Sampled quarterly as part of soil gas monitoring program
SG-12-04-58	TO-15 (5&20)	Soil Gas	SUMMA®/SOPs 1-4 and 7	Rebound study sample
SG-12-04-65	TO-15 (5&20)	Soil Gas	SUMMA®/SOPs 1-4 and 7	Sampled quarterly as part of soil gas monitoring program
SG-12-06-70	TO-15 (5&20)	Soil Gas	SUMMA®/SOPs 1-4 and 7	Rebound study sample
SG-12-07-65	TO-15 (5&20)	Soil Gas	SUMMA®/SOPs 1-4 and 7	Rebound study sample
SG-12-08-70	TO-15 (5&20)	Soil Gas	SUMMA®/SOPs 1-4 and 7	Rebound study sample
SG-12-14-70	TO-15 (5&20)	Soil Gas	SUMMA®/SOPs 1-4 and 7	Rebound study sample
SG-12-16-70	TO-15 (5&20)	Soil Gas	SUMMA®/SOPs 1-4 and 7	Rebound study sample
SG-12-17-60	TO-15 (5&20)	Soil Gas	SUMMA®/SOPs 1-4 and 7	Rebound study sample
SG-12-18-70	TO-15 (5&20)	Soil Gas	SUMMA®/SOPs 1-4 and 7	Rebound study sample
SG-12-20-70	TO-15 (5&20)	Soil Gas	SUMMA®/SOPs 1-4 and 7	Rebound study sample
MW-12-20-180U	8260-SIM	Groundwater	PDB/SOP #5	Sample at highest saturated PDB station
MW-12-24-180U	8260-SIM	Groundwater	PDB/SOP #5	Sample at highest saturated PDB station
MW-12-25-180U	8260-SIM	Groundwater	PDB/SOP #5	Sample at highest saturated PDB station

Notes:

[1] SOPs for soil gas monitoring are presented in Soil Gas QAPP Revision 4 (AEI, 2019a); SOPs for groundwater monitoring are presented in Groundwater QAPP Revision 7 (AEI, 2019b).

[2] The last two digits of the soil gas probe ID represent the depth of the probe below ground surface.

[3] TO-15 (5&20): This method involves full scan gas chromatograph/mass spectrometer (GC/MS) analysis of whole air samples collected in evacuated stainless steel canisters. Samples are analyzed for VOCs using EPA Method TO-14A/TO-15 protocols. An aliquot of up to 50 milliliters of air is withdrawn from the canister utilizing a volumetric syringe or mass flow controller. This volume is loaded onto a hydrophobic multibed sorbent trap to remove water and carbon dioxide and to concentrate the vapor sample. The focused sample is then flash-heated to sweep adsorbed VOCs onto a secondary trap for further concentration and/or onto a GC/MS for separation and

detection. The 5&20 analytical configuration has base LOQs of approximately 34 µg/m3 for PCE and 27 µg/m3 for TCE. The methodology is described in more detail in Eurofins SOP #91 in Attachment A of Soil Gas QAPP Revision 4.
SG = soil gas [probe]
MW = monitoring well
PDB = passive diffusion bag
SIM = selected ion monitoring

3.3 Analytical Requirements – Sample Volumes/Preservation Requirements Table (Worksheet #19)

Information for this worksheet is included in Soil Gas QAPP Revision 4 (AEI, 2019a).

3.4 Field Quality Control Sample Summary (Worksheet #20)

Matrix	Frequency -Field Duplicate Samples	Frequency – Trip Blanks	Frequency – Field Blanks
Soil Gas	10% per quarter (1Q through 3Q 2020)	N/A	N/A

Notes:
N/A = not applicable
Q = quarter

3.5 Project Field Sampling SOP Table (Worksheet #21)

Information for this worksheet is included in Soil Gas QAPP Revision 4 (AEI, 2019a).

3.6 Field Equipment Calibration, Maintenance, Testing, and Inspection Table (Worksheet #22)

Information for this worksheet is included in Soil Gas QAPP Revision 4 (AEI, 2019a).

3.7 Analytical SOP References Table (Worksheet #23)

Information for this worksheet is included in Soil Gas QAPP Revision 4 (AEI, 2019a).

3.8 Analytical Instrument Calibration QC Table (Worksheet #24)

Information for this worksheet is included in the Soil Gas QAPP Revision 4 (AEI, 2019a).

3.9 Analytical Instrument and Equipment Maintenance, Testing and Inspection Table (Worksheet #25)

Information for this worksheet is included in Soil Gas QAPP Revision 4 (AEI, 2019a).

3.10 Sample Handling System (Worksheet #26)

Information for this worksheet is included in Soil Gas QAPP Revision 4 (AEI, 2019a).

3.11 Sample Custody Requirements (Worksheet #27)

Information for this worksheet is included in Soil Gas QAPP Revision 4 (AEI, 2019).

3.12 Analytical QC Sample Table (Worksheet #28)

Information for this worksheet is included in Soil Gas QAPP Revision 4 (AEI, 2019a).

3.13 Project Documentation and Records (Worksheet #29)

Information for this worksheet is included in Soil Gas QAPP Revision 4 (AEI, 2019a).

3.14 Analytical Services Table (Worksheet #30)

Information for this worksheet is included in Soil Gas QAPP Revision 4 (AEI, 2019a).

4.0 Assessment and Oversight

4.1 Planned Project Assessments Table (Worksheet #31)

Information for this worksheet is included in Soil Gas QAPP Revision 4 (AEI, 2019a).

4.2 Assessment Findings and Corrective Action Responses (Worksheet #32)

Information for this worksheet is included in Soil Gas QAPP Revision 4 (AEI, 2019a).

4.3 Quality Assurance (QA) Management Reports Table (Worksheet #33)

Information for this worksheet is included in Soil Gas QAPP Revision 4 (AEI, 2019a).

5.0 Data Review

5.1 Verification (Stage 1) Process Table (Worksheet #34)

Information for this worksheet is included in Soil Gas QAPP Revision 4 (AEI, 2019a).

5.2 Validation (Stages 2A and 2B) Process Table (Worksheet #35)

Information for this worksheet is included in Soil Gas QAPP Revision 4 (AEI, 2019a).

5.3 Validation (Stages 2B and 4) Summary Table (Worksheet #36)

Information for this worksheet is included in Soil Gas QAPP Revision 4 (AEI, 2019a).

5.4 Usability Assessment (Worksheet #37)

Information for this worksheet is included in Soil Gas QAPP Revision 4 (AEI, 2019a).

6.0 References

Ahtna Environmental Services (AES), 2015. *Final Remedial Investigation/Feasibility Study Addendum at Sites 2 and 12, Former Fort Ord, California*. February 27. AR# BW-2721B.

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TABLE

Table 1
Soil Vapor Extraction Treatment System
Operation Summary

Date	Air Flow (scfm)	Cumulative Runtime (hrs)	VE-12-01	VE-12-02	VE-12-03	VE-12-04	VE-12-05	VE-06	VE-07	VE-08	VE-09	VE-10	Notes
9/15/2015	834	24.0	Off	Off	Off	Off	Off	On	On	On	On	On	SVETS turned on
12/7/2015	828	1,983.1	Off	On	Off	Off	Off	On	On	On	On	On	Turn on VE-12-02
1/8/2016	827	2,747.5	On	On	Off	Off	Off	On	On	On	On	On	Turn off VE-12-02
1/22/2016	821	3,082.5	On	Off	On	Off	Off	On	On	On	On	On	Turn on VE-12-03, turn off VE-12-01 (no sig mass removal)
2/25/2016	897	3,866.8	Off	On	On	Off	Off	On	On	On	On	On	Turn off VE-12-03, turn on VE-12-02
4/18/2016	921	5,133.3	On	On	Off	Off	Off	On	On	On	On	On	Turned on VE-12-01
7/13/2016	928	7,192.0	On	On	On	On	On	Off	Off	Off	Off	Off	Turned on south wellfield (1&2 already on) and turned off north wellfield (6-10).
9/23/2016	806	8,920.0	Off	Off	Off	Off	Off	On	On	On	On	On	Switch from south to north SVE wellfield for rebound study sampling 9/30
10/19/2016	798	9,538.9	On	On	On	Off	Off	On	Off	Off	On	On	Changed SVE operations due to 3Q results online VE-12-01, -02, -03, -06, -09, & -10
6/22/2017	781	15,427.5	On	On	On	Off	Off	On	Off	On	On	On	Turned on VE-12-08
9/15/2017	798	17,468.5	Off	Off	Off	Off	Off	On	Off	On	On	On	Turned off VE-12-01, VE-12-02, and VE-12-03 for rebound study
10/24/2017	659	18,402.5	Off	Off	Off	Off	Off	On	Off	Off	On	On	Turned off VE-12-08 at 1100 per QAPP rules and agency approval (PCE GW plume shrank 3Q 2017)
7/30/2018	527	25,073.5	Off	Off	Off	Off	Off	Off	Off	Off	On	Off	Turned off VE-12-06 and VE-12-10
2/11/2019	440	29,776.5	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off	SVETS shutdown for rebound study

Notes:
scfm = standard cubic feet per minute

FIGURE

Legend

- Soil Gas Probe Cluster rebound study sample location
- Groundwater Monitoring Well, rebound study sample location
- Buildings
- TCE above SGCL (June 2014)
- PCE above SGCL (June 2014)

N

0 62.5 125 250 Feet

Rebound Study Sampling Locations

QAPP, Volume I, Sites 2 and 12, Appendix C
Addendum No. 1 - Soil Gas Monitoring
Former Fort Ord, California

Ahtna

Figure 1