Final

Addendum 3 to the Remedial Investigation Work Plan

Soil Gas Investigation

FWA 102 Former Communications Site
Fort Wainwright, Alaska

Prepared for

Department of the Army
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ADDENDUM 3

Soil Gas Investigation

Purpose

This document serves as an addendum to the May 2007 *Remedial Investigation/Feasibility Study Management Plan FWA 102 Former Communications Site Fort Wainwright Alaska* (RI Management Plan). This addendum addresses the characterization of soil gas located at the Former Communication Site (FCS) to provide chemical concentration data for the baseline risk assessment. The FCS site has been divided into two primary areas that affect how the fieldwork for the remedial investigation (RI) is conducted: the low probability of encountering Munitions and Explosives of Concern (MEC) Area and moderate to high probability of encountering MEC Area. Figure 3-1 depicts the location of these two areas. This addendum covers collection of sub-slab soil gas samples at all the buildings and subsurface soil gas samples in open areas within the low-probability MEC area only. This addendum does not address plans for collection of soil gas samples within the moderate-to-high MEC area. Plans for collection of soil gas within the moderate to high MEC area will be included in the Interim Draft RI Management Plan.

The U.S. Army, U.S. Environmental Protection Agency (EPA), and Alaska Department of Environmental Conservation (ADEC) have agreed to conduct the remedial investigation/feasibility study (RI/FS) for the FCS using the Triad approach. The RI Management Plan addresses this approach and overall site management and includes the Quality Assurance Project Plan (QAPP) and Field Sampling Plan (FSP). This document is one of many addenda that provide detailed information about specific tasks of the RI/FS. This approach was determined to be the most effective, efficient, and appropriate method for investigating this site.

Background Information

The migration of volatile organic compounds (VOCs) from underlying contaminated soil is described as vapor intrusion and is the risk exposure pathway that will be investigated in this Work Plan Addendum. The historical activities at FCS include chemical spills from maintenance practices; fire training; leaks from tanks, pipelines, and transformers; and burial of drums and other wastes debris. Therefore, it is necessary to assess whether contaminant exposure through vapor intrusion poses potentially unacceptable risks to human health. Ambient outdoor air risk estimates and additional information on exposure pathways are included in the Risk Assessment Work Plan, Section 3.4.3.

Delineation of the MEC boundary lines, as shown on Figure 3-2, was accomplished by overlaying 2003, 2004, and 2007 geophysical data with 1949, 1956, 1982, and 2005 aerial photographs and digitizing polygons around areas that either had geophysical anomalies or surface debris. Historical photographs were used to identify areas where MEC disposal was most likely to have occurred. All of MEC uncovered to date has been within these areas. The boundary lines were conservatively expanded to the north of the tree line area and adjusted

to the west to easily distinguish housing units in each area. The geophysical data shown on Figure 3-2 is from 2004, prior to construction of the housing. The 2004 data are not clouded by anomalies from new construction.

Previous Sampling Results

A passive soil gas investigation was conducted at FCS in 2006 as part of the Preliminary Source Evaluation (PSE) Phase II Investigation. The 2006 soil gas investigation was conducted in the northwest potion of the site and near Building 49. It consisted of passive soil gas samples collected in 35 locations with a Gore™ Sorber. The sample locations selected in the PSE II Investigation were generally widespread within the northwest portion of the site to confirm the presence or absence of VOCs and not to define nature and extent. Previous passive soil gas sample points and area of elevated VOCs are shown on Figure 3-2.

Petroleum-derived constituents (total petroleum hydrocarbons [TPH]; C-11, C-13, and C-15 hydrocarbons; naphthalenes; and trimethylbenzenes) were detected in almost all sample locations (33 of 35), suggesting these compounds were ubiquitous throughout the area of investigation. Benzene, toluene, ethylbenzene, and xylene (BTEX) compounds were detected less frequently (6 of 35 locations) along the northern border of the FCS. Of the chlorinated solvents, only trichloroethene (TCE) and tetrachloroethane (PCE) were detected, and they appeared in fewer locations than petroleum constituents (5 out of 35 locations). The source of the PCE and TCE was assumed to be solvent use from the former motor pool. Tentatively identified compounds (TICs) detected appeared to be limited to chlorofluorocarbons (CFCs). The CFC source is unknown and is believed to be unrelated to the petroleum source. It is possible these constituents are associated with foam insulation covering underground utilities. The sample results from the PSE II Investigation are qualitative and cannot be used to determine actual concentrations of VOCs in a given location. Consequently, active soil gas sampling will be conducted to evaluate the nature and extent of VOCs in soil in this investigation.

Data Quality Objectives (DQOs)

A DQO process was used to determine the accuracy and quality specification that the collected data must meet to fill existing data gaps for the RI/FS. The purpose of the data is to decide whether future indoor residents may be exposed to VOC concentrations in soil gas that pose a potential for unacceptable risks through a vapor intrusion pathway. The soil gas test method should be capable of detecting VOCs at EPA Region VI values for Ambient Air Screening Levels multiplied by a factor of 10 (to adjust for soil gas to indoor air attenuation). Table 3-1 (at the end of this addendum) includes these values. The soil gas results will be evaluated by using the advanced Johnson and Ettinger (1991) *Model for Subsurface Vapor Intrusion into Buildings, Updated 2003* (SG-ADV Version 3.1; 02/04) (EPA, 2003) to estimate potential exposure from vapor intrusion. To the greatest extent possible, the site-specific building dimensions, foundation thicknesses, design values for air exchange rates, and other information will be used for the modeling. Additional site-specific factors (temperature, soil type, etc.) will be adjusted from the default values to provide site-specific estimates of exposure to vapors at FCS. Data obtained from this investigation will supplement soil and groundwater investigation results to refine the contaminant source evaluation for the FCS

site. In addition, sub-slab samples will be collected at the School Age Services (SAS) building, located adjacent to the northwest boundary of the FCS, to address the indoor air risk at that facility.

Sampling Locations

Figure 3-1 depicts the boundary of the low probability of encountering MEC area and the moderate to high probability of encountering MEC area. The sampling locations covered in the addendum are restricted to sub-slab locations and to the Low Probability MEC Area. Plans for collection of soil gas within the Moderate to High MEC Area will be included in the Interim Draft RI Management Plan.

Figure 3-2 shows the proposed 75 soil gas sample points in the Low Probability MEC Area and 30 sample locations at each building in the Moderate to High MEC Area for sub-slab samples (MEC area procedures addressed in RI Management Plan) for a total of 105 sample point shown. Sample location rationale is as follows:

1. One soil gas sample at each building for estimating risk of vapor intrusion to indoor air (25 samples from existing buildings in Low Probability MEC Area, 10 samples from potential future construction building footprints in Low Probability MEC Area, and 30 samples for existing buildings in Moderate to High MEC Area)
2. In areas of known VOC contamination, such as the northwest area of FCS, additional sample points to assess the extent of contaminations (22 samples)
3. In areas with no detected VOCs or no data (because of incomplete historical data), samples to identify potential sources (11 samples)
4. Targeting of the former slough channel to evaluate potential preferential pathways[1] (6 samples)
5. Sub-slab samples at the SAS building to address indoor air quality at that facility (1 sample shown, more possible)

Geophysical Anomaly and Utility Avoidance

Soil gas sample locations will be selected to avoid geophysical anomalies and existing utilities. Fifty-five of the proposed soil gas sampling points will be collected at a depth of 3 inches below the slab in the garage of each building. This sampling is considered safe from MEC hazard because sample equipment will not penetrate below the engineered backfill under each building. Careful review of as-built drawings, discussions with the construction contractor, and observations of utilities at the exposed slabs within the exclusion zone were conducted to reduce the chances for affecting buried utilities.

For soil gas samples in open areas GPS coordinates for sample locations, shown on Figure 3-2, will be used to mark sample locations in the field. The sample locations were selected to avoid geophysical anomalies and utilities. Additional anomaly avoidance and

[1] Note that soil type (identified through logging of soil borings) will also be used to evaluate potential for preferential pathways in the former slough channel.

location clearance with a magnetometer and current induction methods will be used if applicable.

Sample Collection Methods and Analyses

At each building, the slab will be cored in the garage area and a soil gas sample will be collected at a depth of 3 inches below the slab in accordance with EPA guidance (Attachment 1). In open areas, soil gas probes will be installed to a depth of approximately 6 feet below ground surface by using a direct-push drill rig. Soil gas samples will be collected directly into a Summa canister with Teflon tubing following the procedures outlined in the *Field Sampling Plan* (CH2M HILL, 2007). All soil gas results will be analyzed following EPA Method TO- 15. A list of the analytes and corresponding reporting limits for this method are summarized in Table 3-1.

TABLE 3-1
Reporting Limit Objectives for Method TO-15

Analyte	Reporting Limit (ug/m^3)	USEPA Region VI Ambient Air Screening Level (ug/m^3)	Target Sub-slab Vapor Intrusion Screening Level (ug/m^3)[1]
1,1,1,2-Tetrachloroethane	1	0.26	2.6
1,1,1-Trichloroethane	1	2300	23,000
1,1,2,2-Tetrachloroethane	1	0.033	0.33
1,1,2-Trichloroethane	1	0.12	1.2
1,1-Dichloroethane	1	730	7,300
1,1-Dichloroethene	1	210	2,100
1,1-Dichloropropene	1	NA	NA
1,2,3-Trichlorobenzene	1	NA	NA
1,2,3-Trichloropropane	1	0.00096	0.0096
1,2,4-Trichlorobenzene	1	4.2	42
1,2,4-Trimethylbenzene	1	6.3	63
1,2-Dibromo-3-chloropropane	1	0.0001	0.001
1,2-Dibromoethane (EDB)	1	0.0034	0.034
1,2-Dichlorobenzene	1	0.25	2.5
1,2-Dichloroethane	1	0.074	0.74
1,2-Dichloropropane	1	0.099	0.99
1,3,5-Trimethylbenzene	1	6.2	62
1,3-Dichlorobenzene	1	8.3	83
1,3-Dichloropropane	1	NA	NA
1,4-Dichlorobenzene	1	0.28	2.8
2,2-Dichloropropane	1	NA	NA
2-Butanone	1	5200	52,000
2-Chlorotoluene	1	73	730
2-Hexanone	1	NA	NA
4-Chlorotoluene	1	NA	NA
4-Methyl-2-pentanone	1	3100	31,000

TABLE 3-1
Reporting Limit Objectives for Method TO-15

Analyte	Reporting Limit (ug/m^3)	USEPA Region VI Ambient Air Screening Level (ug/m^3)	Target Sub-slab Vapor Intrusion Screening Level (ug/m^3)[1]
Acetone	5	3300	33,000
Benzene	1	0.25	2.5
Bromobenzene	1	12	120
Bromochloromethane	1	NA	NA
Bromodichloromethane	1	0.11	01.1
Bromoform	1	1.7	17
Bromomethane	1	5.2	52
Carbon disulfide	1	730	7,300
Carbon tetrachloride	1	0.13	1.3
Chlorobenzene	1	52	520
Chlorodibromomethane	1	0.08	0.8
Chloroethane	1	NA	NA
Chloroform	1	0.084	0.84
Chloromethane	1	1.1	11
cis-1,2-Dichloroethene	1	37	370
cis-1,3-Dichloropropene	1	NA	NA
Dibromomethane	1	NA	NA
Dichlorodifluoromethane	1	210	2,100
Ethylbenzene	1	1100	11,000
Hexachlorobutadiene	1	0.087	0.87
Isopropylbenzene	1	400	4,000
m,p-Xylenes	1	100	1,000
Methyl tert-butyl ether (MTBE)	1	7.4	74
Methylene chloride	1	4.1	41
Naphthalene	1	3.1	31
n-Butylbenzene	1	37	370
n-Propylbenzene	1	37	370
o-Xylene	1	730	7,300
p-Isopropyltoluene	1	NA	NA
sec-Butylbenzene	1	37	370
Styrene	1	1100	11,000
tert-Butylbenzene	1	37	370
Tetrachloroethene	1	0.33	3.3
Toluene	1	5200	52,000
Total Xylenes	1	100	1,000
trans-1,2-Dichloroethene	1	63	630
trans-1,3-Dichloropropene	1	NA	NA
Trichloroethene	1	0.017	0.17
Trichlorofluoromethane	1	730	7,300
Vinyl chloride	1	0.16	1.6

ug/m^3 = micrograms per cubic meter

[1] EPA Region VI values for Ambient Air Screening Levels are multiplied by an attenuation factor of 10 to adjust for soil gas to indoor air attenuation.

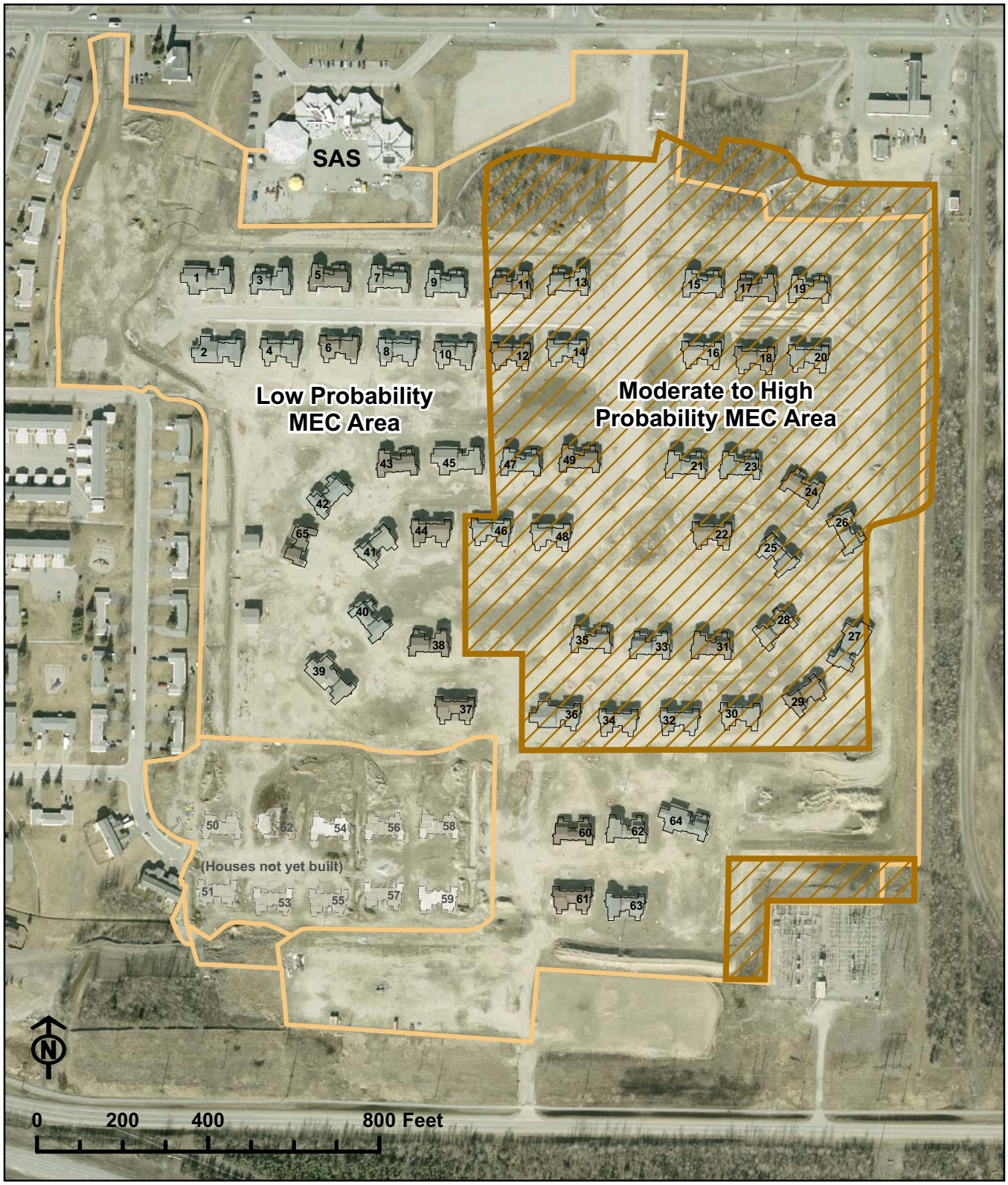

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Figure 3-1
MEC Areas and Security Fences
Former Communications Site
Fort Wainwright, Alaska

Figure 3-2
Former Communications Site
Fort Wainwright, Alaska
Soil Gas Sample Locations

Legend

- Moderate to high probability MEC area
- Former slough channel
- Area within elevated VOC/POL concentrations
- 2006 passive gas sample locations
- Proposed soil gas locations

2004 Magnetic Data Vertical Gradient

- -4000
- -1000
- -500
- -200
- -100
- -75
- -50
- -20
- 0
- 40
- 75
- 100
- 200
- 500
- 1000
- 2000
- 4000

0 100 200 300 400 Feet

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Attachment 1

Standard Operating Procedure for the Collection of Sub-Slab Vapor Samples Using Summa™ Canisters

This procedure describes the approach for the collection of sub slab soil vapor samples in Summa canisters. It includes instruction on probe installation, leak checking, gas sampling, and probe abandonment. This SOP should be used in conjunction with project data quality objectives. Only persons trained in the collection of soil gas samples should attempt this procedure

1.0 Materials

1.1 Probe Installation
- Hammer drill and 7/8″ or 1″ and 5/16″ or 3/8″ bits
- Vacuum cleaner ('shop vac' type or hand held)
- Probe (1/4″ stainless steel tube with Swagelock or equivalent nut and ferrule)
- Probe seal (1/8″ NPT internal wrenching plug)
- Probe union (1/4″ male Swagelock or equivalent to 1/8″ female NPT)
- Nuts and ferrules (1/4″ stainless steel Swagelock or equivalent)
- Hack saw
- Mortar consisting of Portland Cement mix, Fix-it-All, or similar
- Large Q-tips or paper towels and water
- Tongue depressor, putty knife, or similar tool
- Tape measure

1.2 Leak check
- Leak check enclosure
- Compressed helium tank (balloon grade), helium regulator, flow meter (0-500 ml/min)
- Helium detector, or equal
- (alternative) Isopropyl alcohol and paper towels

1.3 Sampling
- Sampling union (1/4″ male Swagelock or equivalent to 1/4″ male NPT)
- Vacuum pump, sampling manifold
- ¼″ Teflon tubing, rubber tubing
- Flow controller
- Summa canister (sized appropriately for sampling requirements)
- Miscellaneous fitting to connect tubing to sampling union and Summa canister)

1.4 Probe Abandonment
- Probe removal fitting
- Crowbar

1.5 Miscellaneous
- Teflon tape
- 9/16″, ½″, crescent wrench, screw driver
- Extension cord
- Timer/watch
- Tools required to cut carpet, and/or tools needed for removal of other floor coverings

2.0 Probe Installation

2.1 Locate the sampling locations in accordance with the work plan. Check with local utility companies to identify utilities coming into the building from outside. If possible, look for known or suspected utility conduits and note their location on a map or in the field log. Be sure to confirm that the sample locations will not interfere with the known

underground utilities. Also note the location of the probe, locations of significant features (walls, cracks, sumps, drains, etc), and conditions of the slab and soil.

2.2 If needed, expose the concrete by cutting the carpet or other loose floor coverings (Note: Carpet need not be removed, but rather a 'L' shape cut to expose the concrete for drilling and the leak check enclosure). Drill a 7/8" or 1" diameter hole to a depth of 1-3/4" (measured to the center of the hole) to allow room for the installation of the probe nut and probe union (See Figure 2). Remove the cuttings using a vacuum cleaner. Be careful to not compromise the integrity of the slab during drilling (i.e., cracking it), although note if this occurs. It is important that the slab and the probe hole remain air tight for sampling and that cracks are noted.

2.3 Drill a 5/16" or 3/8" diameter hole through the remainder of the slab and approx. 3" down into the sub-slab material (See Figure 3). Drilling into the sub slab material creates a void that is free of obstructions that might plug the probe during sampling. Record the total depth of the slab and the depth drilled into the sub slab material.

2.4 Once the total depth of the slab is known, be sure that the probe (1/4" stainless steel tube with Swagelock or equivalent nut and ferrule) is cut with a hacksaw so that it does not extend beyond the bottom of the slab. Attach the probe union (1/4" male Swagelock to 1/8" female NPT) to the probe and tighten. Wrap the probe seal with Teflon tape and tighten into the union. See Figure 8 for an expanded view of the probe parts.

2.5 Wet the walls of the hole using the Q-tip or moistened paper towel. This helps the mortar bond to the drilled concrete. Prepare the mortar in accordance with manufacturer's directions to a stiff consistency. Make sure that the consistency is such that the mixture will not run down the sides of the hole and potentially clog the probe or hole. Place sample probe and sample union part way into the hole as shown in Figure 4. The probe tip should be at least one inch into the smaller diameter hole, but not so far that mortar can not be easily placed in the large diameter hole around the probe fittings. It is critical that the mortar mixture does not get into either end of the probe and cause a plug. Using the tongue depressor or similar tool, apply mortar around the base of the sampling probe and sampling union such that it will be sealed once it is in place.

2.6 Fill the hole with mortar, and press the probe further into the hole until its top is flush with the floor. In doing so, slightly wiggle the probe to create good 'wetting' contact between the probe and the mortar as well as the mortar and the drilled concrete. Scrape off excess and make sure there is clear access to the probe. See Figure 5.

2.7 Let dry for 24 hours

2.8 Be sure to never leave the probe hole open to atmosphere for extended periods to minimize the effects of surface infiltration.

3.0 Manifold Assembly and leak check

3.1 Make sure the sampling system is assembled (as shown in Figure 1 or 10) by connecting the sampling manifold to the soil gas probe and the purge system. <u>Do not connect the flow controller or canister at this time</u>.

3.2 Make sure the gas probe valve (valve #1) is closed.

3.3 Open the sample valve (valve #2) and the purge valve (valve #3) and turn the vacuum pump on. Make sure that the flow meter on the vacuum pump exhaust is reading 200 ml/min. Let the pump run for 1 minute to allow purging of potential contaminants from the manifold

3.4 Now close valve #2 to achieve a vacuum gauge reading of 10 inches of mercury or to a vacuum that will be encountered during sampling, which ever is greater. Close the purge valve #3 and shut the vacuum pump off.

3.5 If the pressure in the manifold has not changed after a minute, then the manifold is considered leak free. If not, repair any leaks prior to use and re-check the manifold.

3.6 Record the leak check date and time on the field sampling log.

4.0 Probe Leak Check and Probe Purging

4.1 The sampling system needs to be leak-checked and purged before sampling. Two different methods supported by the available literature/guidance are presented. One method uses helium gas as a tracer and allows for the assessment of potential probe leak prior to sample collection. The other method uses isopropyl alcohol as a tracer and allows for the assessment of potential probe leak after sample collection and analysis. Both these methods are acceptable and are detailed below.

4.1.1 Helium leak checking technique and purge

4.1.1.1 Remove the probe seal insert, wrap the sampling union fitting threads (1/8″ male NPT to ¼″ male Swagelock or equivalent) with Teflon tape (wrap the NPT threads only), and tighten into the exposed probe fitting. Thread the Teflon sample tubing through the rubber grommet in the leak check enclosure from the outside, and attach the tube to the sampling union using a nut and ferrule. Slide the enclosure down so it seals on the concrete slab. Attach the other end of the sample tube to the sampling manifold. See Figure 6 and 7.

4.1.1.2 Attach tubing to the flow meter on the helium tank regulator and the other end to the enclosure. Attach the exhaust tube to the enclosure and position the other end as far away as possible to avoid detection by the helium leak detector. See figure 9.

4.1.1.3 Put the helium detector on the exhaust line from the sample pump. Make sure valve 1 is closed. Open valves 2 and 3. Turn on the sample pump and helium detector.

4.1.1.4 Open the helium tank and set the flow meter for approximately 200 ml/min. Allow it to flow for 1 minute to fill the leak check enclosure before starting the purge. Make sure that the detector is not reading any helium before starting the purge.

4.1.1.5 Two liters of sub slab gas need to be purged before sampling. The purge time is 10 minutes at a flow rate of 200 ml/min. Close valve #2 and open valve #1 simultaneously and start timing for the purge volume. During the purge, observe the helium detector for indication of probe leakage (e.g. infiltration of room air into the probe). If a reading of >5% is observed, then the probe leak check has failed, and corrective action is required. This includes first checking the fittings and trying another purge and leak check. But may result in removing the probe and re-cementing it.

4.1.1.6 At the end of the purge time, close valves #1 and #3 and turn the pump off. If at any time during the purge the detector read < 5%, then the system is leak free and ready for sampling. If >5% was observed, then check the fittings and try again. If <5% cannot be achieved, then this probe must be abandoned and a new hole drilled. Be sure to record the helium leak check value on the field sheet.

4.1.1.7 Close the helium tank valve.

4.1.2 Isopropyl alcohol leak checking technique and purge

4.1.2.1 Moisten a paper towel with isopropyl alcohol. Wrap the isopropyl alcohol moistened paper towel around probe fittings at the slab surface. Note: It is important to keep the isopropyl alcohol completely away from the sample equipment and SUMMA Canister during the set up phase. The sampler must also change nitrile gloves between setting up the sample equipment and conducting the leak detection test. It is also important to instruct the laboratory to analyze for isopropyl alcohol. If isopropyl alcohol is detected by the laboratory at a concentration greater than 5% (50,000 ppmv) then the sample is deemed to be invalid due to a leak.

4.1.2.2 Two liters of sub slab gas need to be purged before sampling. The purge time is 10 minutes at a flow rate of 200 ml/min. Close valve #2 and open valve #1 simultaneously and start timing for the purge volume.

4.1.2.3 At the end of the purge time, close valves #1 and #3 and turn the pump off.

5.0 Sampling

5.1 The Summa canister has been evacuated to near absolute zero pressure. Care should be used at all times to prevent inadvertent loss of canister vacuum. Never open the valve affixed to the canister unless the intent is to collect sample or check the pressure. Use only a canister that has been certified to be clean.

5.2 Remove the canister valve cap, attach the vacuum gauge to the canister, and open the canister valve. Record the pressure reading and close and remove the valve. The pressure in the canister should be between 28″ and 30″ of mercury. If not, then the canister has leaked and should not be used for sampling.

5.3 Connect the flow controller to the manifold (at valve #2) and the Summa canister to the flow controller. The port on the flow controller that reads 'HP' or 'In' should be attached to the manifold. The port that reads 'LP' or 'Out' should be attached to the canister. Use only a flow controller that has been cleaned and properly adjusted.

5.4 To take the sample, confirm valve #3 is closed, and open valves #1 and #2. Slowly open the canister valve approximately one (1) full turn, and start timing. Record the start time on the field sampling log. During the sampling period, record the lowest pressure from the manifold gauge on the field log.

5.5 There are different sample time and flow rate protocols. These are subject to project requirements.

5.5.1 5 minute sample period, 850 ml canister: The flow controller is set for 150 ml/min. For an 850 cc Summa canister, it will take 5 minutes to collect a sample.

5.5.2 24 hour sample period, 6 liter canister: The flow controller is set for 3.75 ml/min. For a 6 liter Summa canister, it will take 24 hours to collect a sample.

5.6 At the end of the time, close the sample valve (valve #2) and the valve affixed to the canister. Remove the canister from the apparatus.

5.7 Re-attach the vacuum gauge and record the final pressure. The canister should only have 750 mls of sample in it based on a 150 ml/min sampling rate for 5 minutes. This should equate to between 2″ and 5″ final pressure in the canister. Record the sampling date, time, canister ID, flow controller ID, and any other observation pertinent to the sampling event on the field sampling log.

5.8 Remove the gauge from the can and tighten the cap back on with a wrench. Verify that canister valve is closed.

5.9 Fill out all appropriate documentation (sampling forms, sample labels, chain of custody, sample tags, etc.).

5.10 Disconnect the sample tubing from the probe, and remove the sampling union.

6.0 Probe Abandonment

6.1 After sampling, it is critical that the probe either be removed or plugged to prevent the creation of a new pathway for vapor intrusion.

6.2 If the probe is to be used again in the future, wrap the probe seal insert with Teflon tape, and tighten it into the probe opening using a hex key until it is tight and flush with the concrete floor.

6.3 If the probe is to be removed, insert the removal fitting into the probe. Using a crow bar, remove the entire probe assembly. If the probe can not be removed in this manner, then over drill the probe with the drill and 1″ bit. Fill the hole with cement mix.

Figure 1 – Sub slab
Sampling

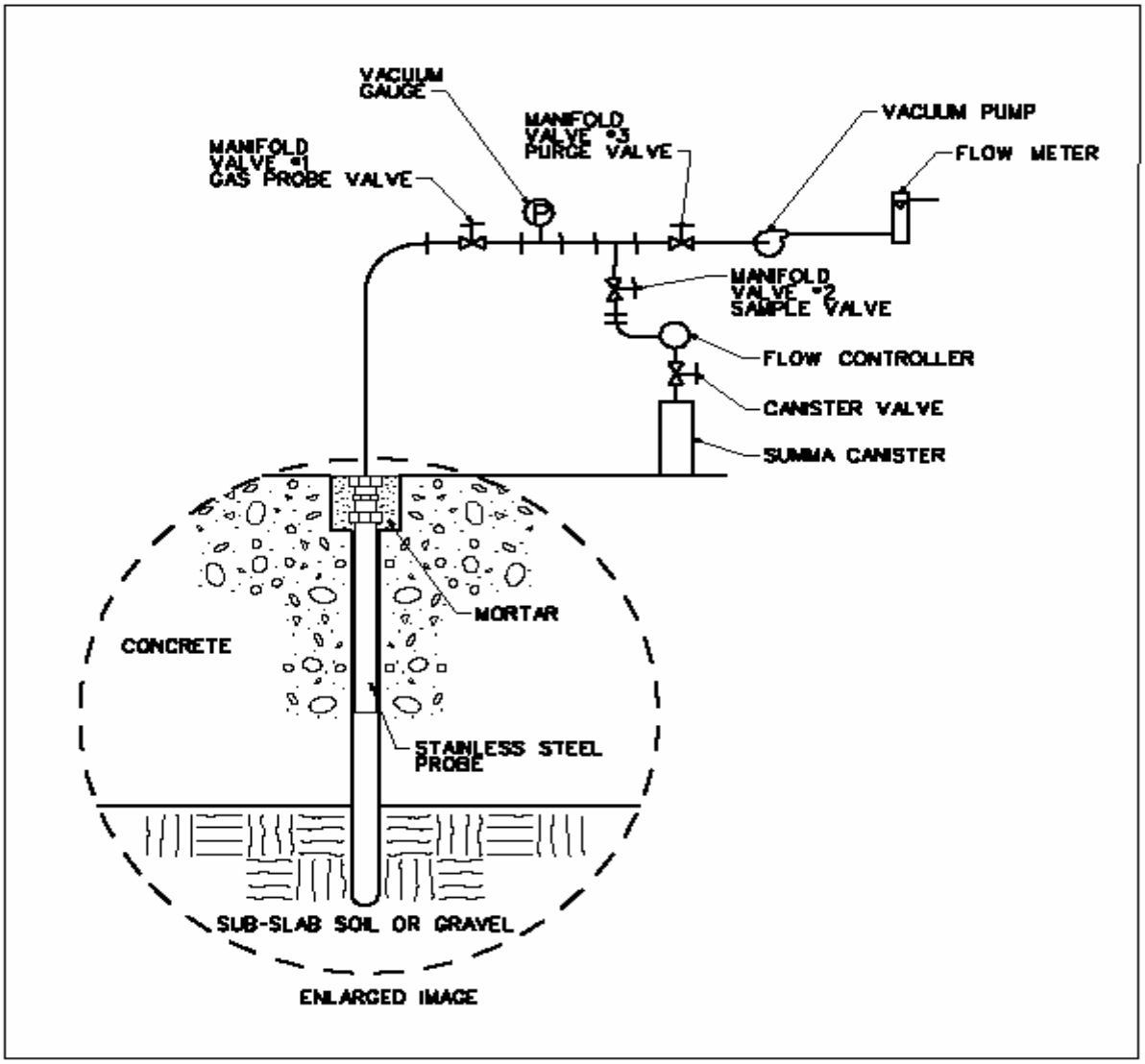


Figure 2 – Drilling 1” mortar hole to a depth of 1 ¾”

Figure 3 – Drilling 3/8” probe hole

Figure 4 – Installing Probe with mortar

Figure 5 – Installed probe, flush with slab

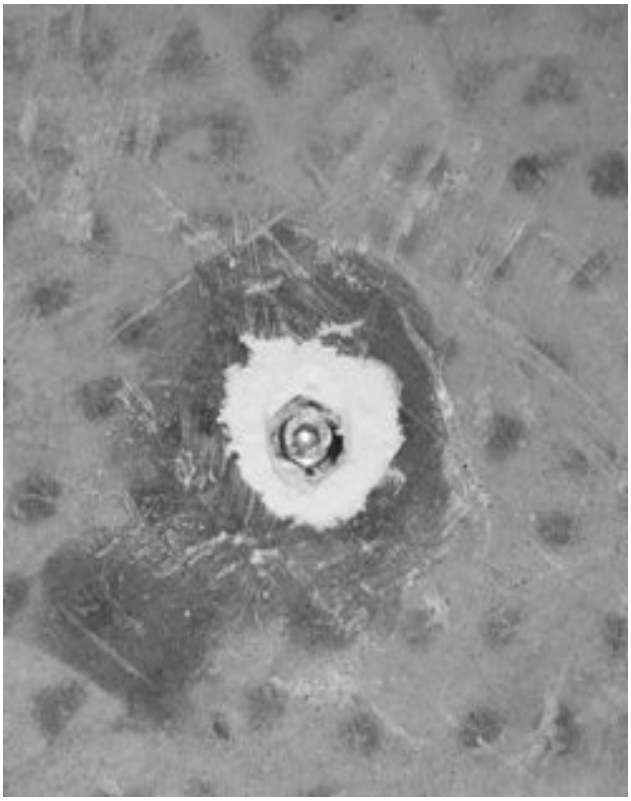


Figure 6 – Installed probe with sample tube

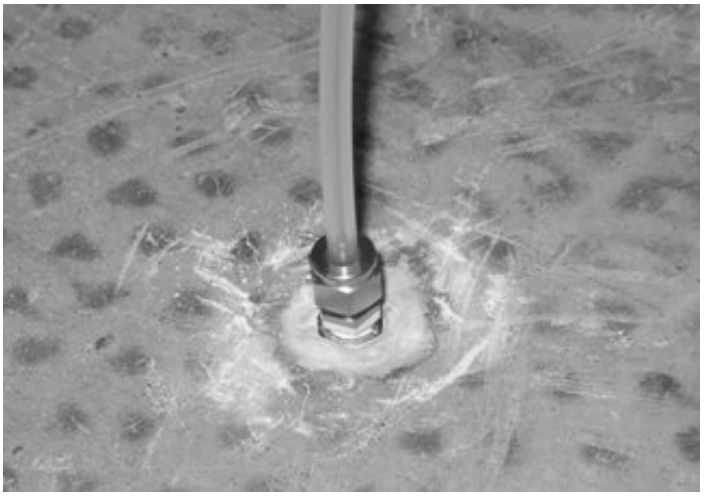
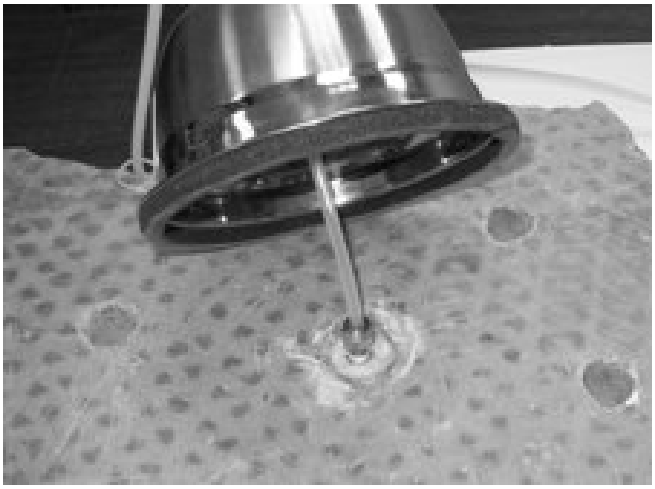


Figure 7 - Installing the helium leak check assembly



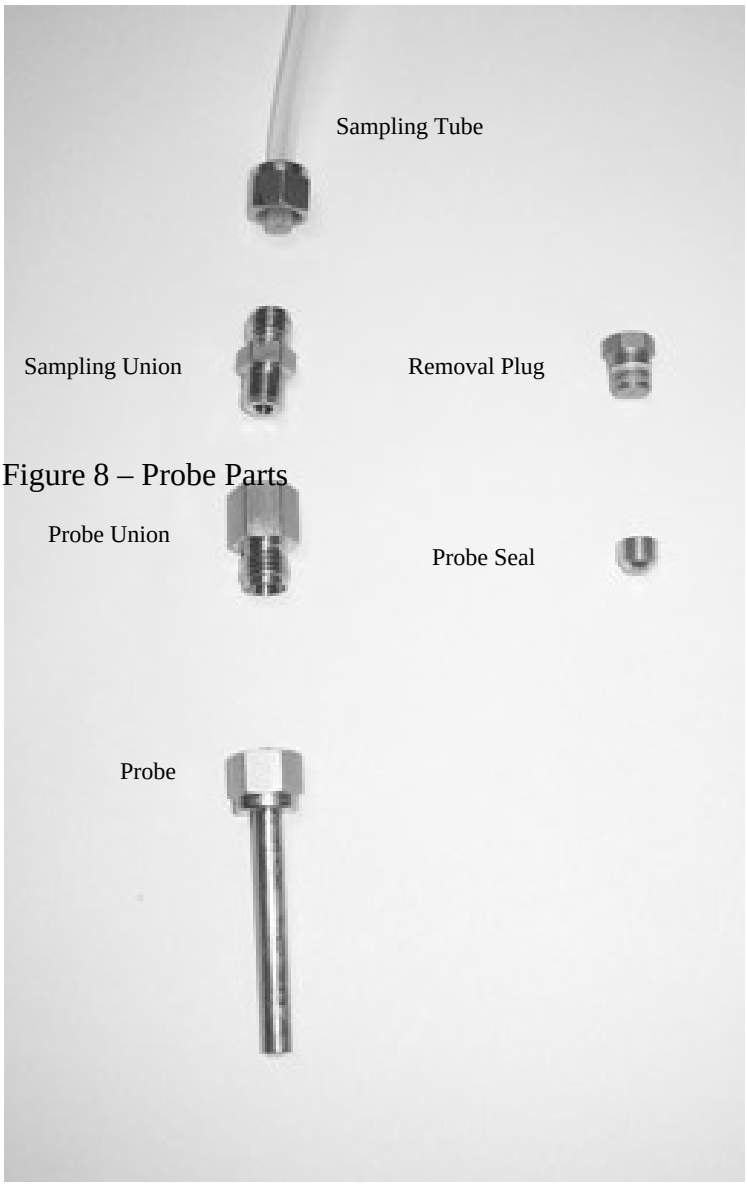


Figure 8 – Probe Parts

Figure 9 –Helium Leak Check Assembly

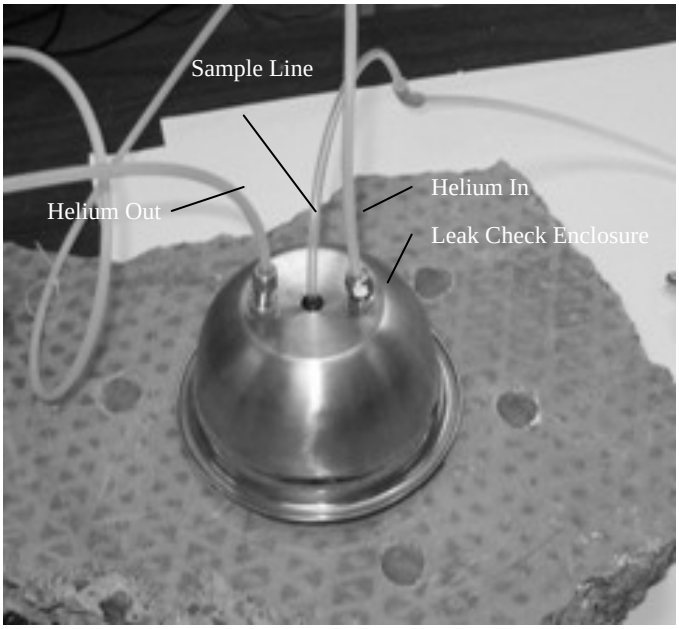
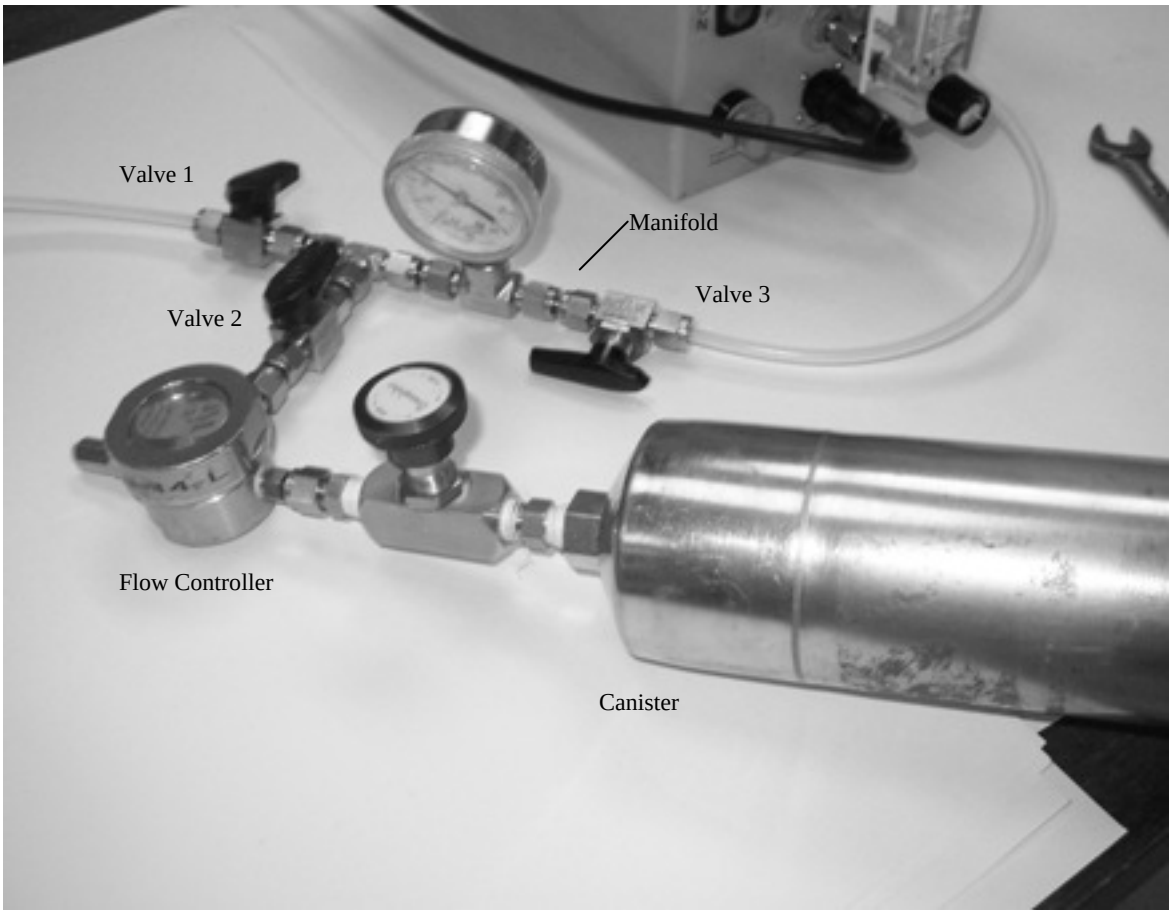



Figure 10 – Sampling Manifold