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*By Alameda County Environmental Health 10:19 am, Apr 22, 2016*

April 18, 2016

Mr. Keith Nowell
Alameda County Health Care Services Agency
1131 Harbor Bay Parkway, Ste. 250
Alameda, CA 94502-6577
keith.nowell@acgov.org

Subject: **Soil, Groundwater, and Soil Gas Workplan Addendum**
3101 35th Avenue, Oakland, CA
Fuel Leak Case No. RO0003164; Global ID T10000006539

Dear Mr. Nowell,

I declare, under penalty of perjury, that the information and/or recommendations contained in the attached *Soil, Groundwater, and Soil Gas Workplan Addendum* are true and correct to the best of my knowledge.

Sincerely,

Ms. Mona Hsieh
Responsible Party Representative

April 18, 2016

Alameda County Health Care Services Agency
Environmental Protection
Attn: Mr. Keith Nowell
1131 Harbor Bay Parkway, Ste. 250
Alameda, California 94502
keith.nowell@acgov.org

**Subject:** **Soil, Groundwater, and Soil Gas Investigation Work Plan Addendum**
Green Oak Builders – RO0003164
3101 35th Avenue, Oakland, California

Dear Mr. Nowell,

On March 24, 2016, Almar Environmental (Almar) submitted a *Soil, Groundwater, and Soil Gas Workplan* for the above referenced site to the Alameda County Environmental Health Department (ACEH) for your review. The Work Plan, in general, proposed to advance five soil bores at the subject site and collect soil and groundwater samples from each bore plus the installation and sampling of one soil gas sample point. In a directive letter dated April 8, 2016, you responded with twelve specific technical comments which required further confirmation and/or clarification. We appreciate your prompt response to the Workplan. Herein, we address each of your technical comments in a bulleted response format:

1. ***Additional Soil Bores*** *– ACEH was provided a figure, captioned Figure 5, as an attachment to an electronic mail dated October 2, 2015. Figure 5 was prepared by Almar and provided additional locations for soil bores which were to be investigated in a work plan approved by ACEH in its letter of the same date. These locations have not been investigated. ACEH requests that the soil bores identified as DP-6 and DP-7 on the October 2, 2015 Figure 5 be incorporated in to the work plan addendum in lieu of the DP-6 proposed in the Work Plan.*

- The requested additional boring location has been added to the proposed scope of work. To avoid confusion, the name of previously proposed boring DP-7 has been changed to DP-10. The new boring locations and names are shown on the attached Figure 1.

2. ***Additional Soil Bores Analysis*** *– The presence of a subsurface structure and suspected hydraulic hoists were identified in the vicinity of the October 2, 2015 DP-6 and DP-7 soil bores. Therefore, ACEH requests semi-volatile organic compounds (SVOCs), using EPA Test Method 8270, total petroleum hydrocarbons (TPH) as diesel (TPHd) and as oil (TPHo), by EPA Test Method 8015, and the five LUFT metals - cadmium (Cd), chromium (Cr), lead (Pb), nickel (Ni) and zinc (Zn)- by EPA Test Method 6010, be added to the scope of analysis for these soil bores. The expanded scope of analysis should be performed on both soil and grab groundwater samples.*

- The requested additional analysis will be performed on all soil and groundwater samples collected from proposed borings DP-6 and DP-7.

3. ***Bore Logs*** *– The Work Plan indicates the soils will be logged using the United (Unified?) Soil Classification System (USCS); however, there is no mention of the use of a photoionization detector (PID) to screen site soils.*

*As previous site work does not include PID screening values on the bore logs, please include language in the work plan addendum indicating a PID will be used and the screening concentrations will be included on the logs.*

- Soils from each boring will be logged using the Unified Soil Classification System (USCS). Soil samples will be collected at five (5) foot intervals and where contamination is observed in the field with the photoionization detector (PID). Additionally, all PID values will be recorded on the boring logs.

4. ***Soil Sampling** – ACEH recommends that soil samples be collected and analyzed at intervals of no more than five feet, in areas of obvious contamination, the soil/groundwater interface, and at significant changes in lithology. If staining, odor, or elevated PID readings are observed over an interval of several feet, a sufficient number of soil samples from this interval should be submitted for laboratory analyses to characterize the fuel hydrocarbon concentrations within this interval. Please ensure that the analytical results define the vertical and horizontal extent of total petroleum hydrocarbon (TPH) impacts at the site. In accordance with the State Water Resources Control Board's (SWRCBs) Low Threat Underground Storage Tank Case Closure Policy (LTCP), ACEH requests at least one soil sample from each bore be recovered from the upper five-foot (0- to 5 feet below the ground surface- bgs) interval and within the five- to- 10-foot bgs interval.*

- The recommended soil sampling intervals will be instituted in the field.

5. ***Groundwater Sampling** – Laboratory provided glassware, consisting of three 40 milliliter (ml) VOAs and one one-liter amber, are proposed for collecting GGW samples from each soil bore. The one-liter amber is for providing a sufficient quantity of sample for use in the TPHd analysis. However, DP-9 is the only bore from which TPHd analysis is proposed. It is unclear to ACEH why GGW samples from the other soil bores will be collected in ambers if TPHd analysis is not anticipated to be performed. Please include the rationale for GGW collection in the work plan addendum requested below.*

- As stated in Section 3.4 of the original Work Plan and as requested by the ACEH in their March 15, 2016 Directive Letter only soil samples from DP-9 will be analyzed for the presence of TPHd. The inclusion of language indicated an amber liter would be collected from each boring was a typographical error on Almar's part. We apologize for this error. However, as requested by the ACEH in the above listed item #2 groundwater samples from proposed borings DP-6 and DP-7 will now additionally be analyzed for TPHd, TPHo, SVOCs and the LUFT 5 metals. These analysis will require groundwater samples to be collected in two additional amber liters (one for TPHd and TPHo and one for the SVOCs) and one unpreserved 500 mL poly container. The metals will be filtered by the analytical laboratory.

6. ***Analysis for Total Petroleum Hydrocarbons as Gasoline** – Proposed soil and GGW analysis includes analyzing for TPH as gasoline (TPHg) by EPA Test Method 8015 and for VOCs by EPA Test Method 8260. As TPHg may also be reported in the 8260 analysis, ACEH recommends the elimination of the 8015 analysis for TPHg and requests the analytical laboratory report TPHg with the 8260 scan. Verify ahead of time that the analytical laboratory can perform the analysis and eliminate the cost for the 8015.*

- Almar agrees with this recommendation to perform all TPHg analysis using EPA Test Method 8260 as a cost saving device and will do so during the investigation.

7. ***Soil Gas Boring Advancement** – Task 6 of Section 4.1- Boring and Construction of Soil Gas Sampling Points states "boring will be advanced with either…" but only identifies one boring advancement technique. Hence, it is unclear to ACEH how the soil gas bore will be advanced. ACEH requests that the bore advancement methodologies be identified and the criteria used for the method selection be provided. Please address the appropriate equilibration time with the method selected. See Technical Comment 8 below. In accordance with the LTCP, ACEH requests the depth of soil gas sample collection be five feet beneath the bottom of the proposed foundation.*

- All soil gas boring will be advanced using a geoprobe macro core direct push sampling method. Each soil gas sample point will be installed to a depth of 5.0 feet below the bottom of the proposed slab on grade foundation. As requested by the ACEH in technical comment 8 (below), Almar will wait a minimum of 48 hours after installation for equilibrium of the soil gas points prior to sampling.

8. ***Soil Gas Bore Equilibration Time*** *– Task 3 in Section 3.3- Groundwater Sampling states that the groundwater recharge rate is known to be slow and that casing may need to be left in the soil bores for up to 24 hours, indicating slow fluid migration in the subsurface. Task 7 in Section 4.2- Purging and Sampling of Soil Gas Sampling Points says the soil gas sampling points will be sampled a minimum of 2 hours after installation. The July 2015 Advisory- Active Soil Gas Investigations prepared by California Environmental Protection Agency/Department of Toxic Substances Control (Cal EPA/DTSC), and the Regional Water Quality Control Boards of the Los Angeles (LARWQCB) and San Francisco (SFRWQCB) regions states that, for soil gas wells installed with the direct push method, not to conduct the purging, leak testing and soil gas sampling for at least two hours following vapor probe installation and that finer-grained material may take longer, up to 48 hours, to equilibrate (emphasis added). ACEH requests an appropriate equilibration time be used for the soil type.*

- Fine grained sediments (Gravelly Clays) are expected to be encountered during the proposed investigation. Therefore, Almar will wait a minimum of 48 hours after installation for equilibrium of the soil gas points prior to sampling.

9. ***Tracer Gas*** *– Please include a description of the techniques to be employed in maintaining and field monitoring of the helium enriched atmosphere during soil gas sample collection.*

- As stated in the original Work Plan, Helium will be used as the tracer gas to ensure that representative soil gas samples are collected from each well. The percentage of helium concentrations will be monitored and recorded throughout the purging and sampling process on the field data sheets. The specific techniques which will be followed during the purging and sampling procedures are described in detail in the attached "Field Guide for Use of the Helium Shrouds" (Attachment A). The field guide was provided by Curtis & Tompkins, Ltd (C&T). C&T will also supply the helium shrouds (and all other necessary equipment) and perform the analytical testing of the soil gas samples.

10. ***Securing of Soil Bores*** *– Please describe what means of securing boreholes will be undertaken should the bores remain open overnight. This applies to both the accumulation of groundwater for sample collection and the equilibration time for the soil gas bore, both referenced in Technical Comment 8 above.*

- Due to slow groundwater recharge rates, it may be necessary to keep the temporary borings open overnight. Should this need arise, the PVC casing will be capped and a small (approx. 6 inch) bentonite seal will be placed around the top of the casing. Similarly, the soil gas sampling points will be capped and sealed with bentonite.

11. ***Standard Operating Procedures*** *– Task 7 in Section 4.2- Purging and Sampling of Soil Gas Sampling Points states "WTI will sample…. " ACEH is not familiar with WTI or its practices. Please include WTI's Standard Operating Procedures for soil gas sample collection as an appendix to the work plan addendum for ACEH review.*

- This was a typographical error. Almar apologizes for this typo. "WTI" should have read "Almar". However, the sampling procedures stated in Task 7 of the original Work Plan do not change and will be followed in the field.

12. ***Investigation Derived Waste*** *– The Work Plan addresses storage, but not disposal, of investigation derived waste (IDW). Please include language in the work plan addendum addressing disposal of IDW. The disposal should occur within 180 days of generation.*

- The analytical results of the proposed investigation will determine how any IDW is handled and disposed. If the analytical results determine that the IDW is a hazardous waste as defined by California Code of Regulations (CCR), Title 22, Chapter 11 the waste will be handled as such and properly handled and disposed of at an accepting landfill.

**Closing Statement**

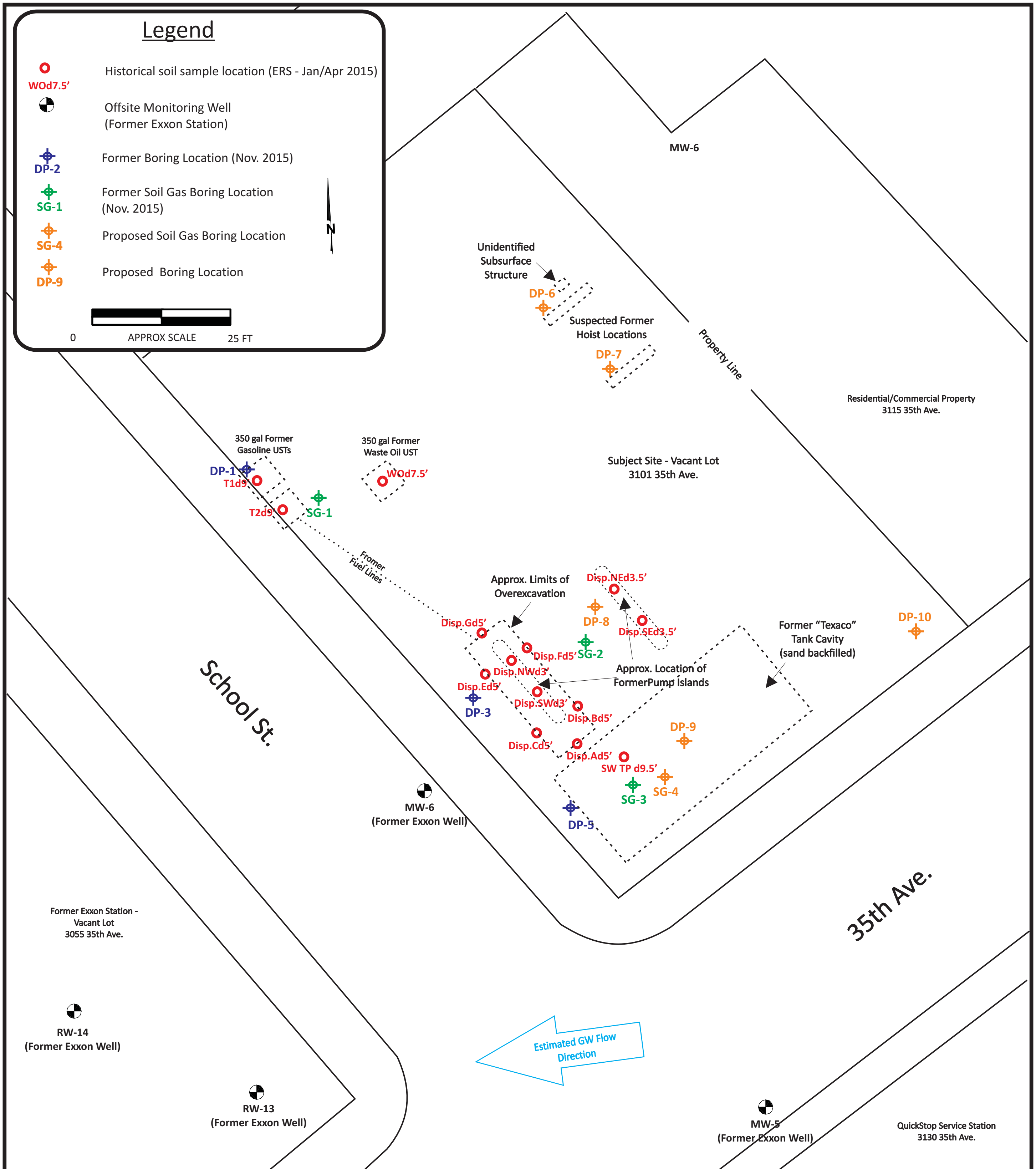
To the best of our knowledge, all statements made in this Work Plan Addendum are true and correct. This Work Plan Addendum is based on data provided by the client and others and a review of historical reports. No warranty whatsoever is made that this Work Plan Addendum addresses all contamination found on the site.

If you have any further questions or require any further information, please do not hesitate to contact us.

Respectfully submitted,

Forrest N. Cook
Owner/Principal Scientist
Almar Environmental
California Professional Geologist #8201 (exp 9/16)

# FIGURES




ALMAR environmental

**3101 35th AVENUE**
**OAKLAND, CALIFORNIA**

**DETAILED SITE MAP SHOWING UPDATED PROPOSED BORING LOCATIONS**

**FIGURE 1**

**ATTACHMENT(S)**

## Table of Content



## Figures & Diagrams

## Introduction

Sampling soil gas wells using Helium leak tracer is not inherently difficult using C&T's equipment, it is relatively unforgiving of mistakes. The equipment has been field tested and through these tests we've learned that good results necessitate reviewing this document and following the procedures specified here. We strongly encourage practicing set-up, Helium charging the shroud, using the detectors, and breakdown. We've seen a very strong correlation between a thorough equipment orientation and successful sampling events. User errors related to a lack of orientation and preparation are the primary root cause of sampling errors and equipment failures.

The equipment supplied by C&T has been critically cleaned, assembled, and leak tested using both pressurized Helium and vacuum decay methods. The preparation of all sampling equipment and media has been thoroughly documented.

If you suspect the sampling equipment is damaged or not functional, before using it please inform your project manager by calling the lab at 510-486-0900. Used and returned damaged equipment will be assessed cost for repair and replacement. Please do not disassemble and reassemble sampling trains and shrouds. They have been critically cleaned, assembled and leak checked for your use without further need for alteration. By breaking connections in sampling trains, users invalidate the lab's cleaning and prep effort.

## Use of and Care for the C&T Helium Detectors

When used properly, C&T's diffusion cell He sensors provide real time measurement of Helium concentration in air from 1% to 99% Helium to accuracies of 0.1%. Prior to delivery, C&T He sensors are calibrated and performance verified. If, upon initial check, you discover the He gauge is apparently not working properly, call your C&T project manager immediately; repair and replacement costs will be assessed for all sensors returned damaged to the lab.

### Figure 1: Diffusion Cell (left) and flow through cell (right) Helium Detectors

**Battery Charges last 4 hours:** Helium Detectors using rechargeable NiCd batteries are fully charged before leaving the lab and hold a charge for 4 hours of use. Turn detectors on for use and off immediately after use and you'll make it through a day's sampling event without losing charge. The lab does not supply rechargers to users because the Diffusion and Flow through types use employ different voltages, using the wrong charger damages the detectors.

3 position switch: **On** is up, **Off** is neutral and down.

**Required use technique for accurate Helium tracer measurements:** These He sensors are sufficiently durable for portable field use; however they are precision measurement devices unforgiving of mistreatment or abuse, accordingly;

- Keep the He sensor clean at all times, particularly around the white diffusion membrane cell opening. Dirt on, or in the diffusion cell well will compromise calibration and result in extra fees for cleaning and recalibration.
- The C&T He sensors are shock sensitive. Dropping the gauges onto a hard surface from a height of 2' or more can compromise calibration and may irreversibly damage the sensor and cause replacement or maintenance cost assessments. Please store and transport the gauges in the foam lined box provided.
- Helium detectors are moisture sensitive, don't get them wet

**Accepting C&T He sensors binds your firm to the following conditions of use.**
Replacement costs are $900 + applicable shipping costs and sales tax. Minimum diagnostic, recalibration, and maintenance charges for damaged sensors are $120.

## 1.0 Setting Up

**Equipment:** The following equipment should be present in the supply kit provided from the lab:

1) Integral shroud box and sampling train with 3 port valve
2) Helium supply components a) Helium bottle(s) (one bottle supplies enough for 4 wells), b) Braided steel Helium transfer tube with male QT connectors and; 3) Helium supply regulator with female QT connector
3) Helium Detector: Diffusion cell type (4 hours use on one charge)
4) Helium Detector: Flow through type (4 hours use on one charge)
5) Male QT ¼" OD Teflon tubing connector for connecting in port on flow through Helium detector to Purge port on Shroud
6) QT Vacuum gauge
7) 1.4 liter Sample canisters, one for each sample to be taken, some users request an extra to cover any aborted sampling events, well relocations etc…
8) Graphite or Ceramic ferules for joining ¼" OD Teflon tubing to well, one provided in each shroud/train inside the nut in the open port of the 3 port valve used to connect the soil gas well to the train.

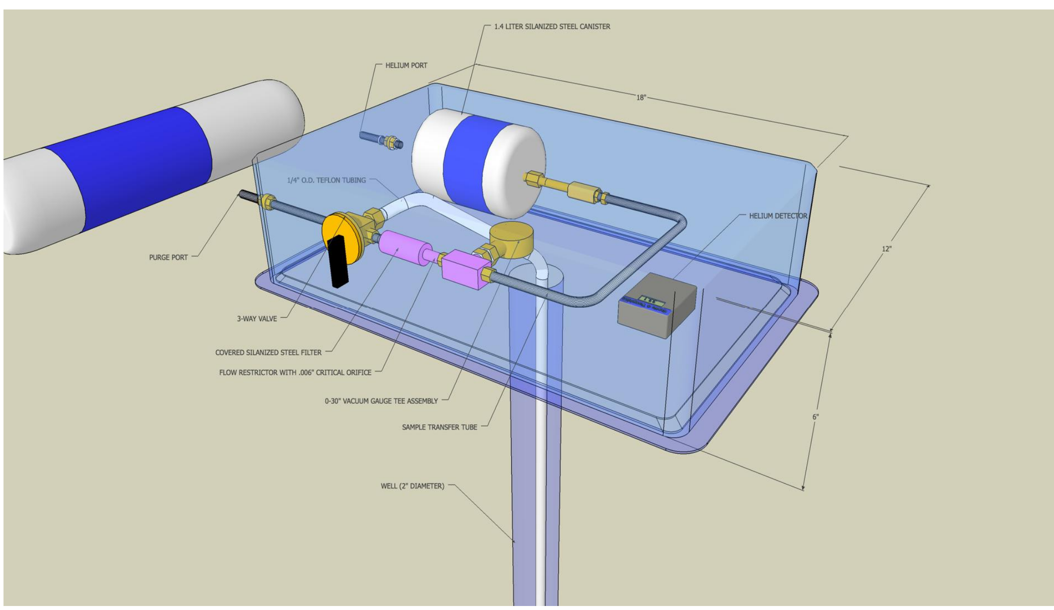
**Equipment not Supplied by C&T:** You will need the following items to complete your work; these items are not supplied by C&T unless specially requested:

1) Well purge suction source, alternatives available from the lab are: a) 50 ml disposable syringe with tubing adapters, b) evacuated 6 liter summa canister with 180 ml/min flow restrictor and filter, c) battery powered vacuum pump, d) 110V VAC powered vacuum pump
2) ½" x 9/16" open end combination wrench and one small crescent wrench. These are the tools needed to make compression fitting connections. C&T does not rent wrenches.
3) Extra Graphite or ceramic ferules as needed to insure you make a good well to train connection
4) ¼ OD Teflon tubing…Typically the well drillers have a lot of this stuff, if you need it
5) Knife (for cutting Teflon tubing)

**Position the shroud lid over the well.** Consistent Helium concentrations arise when the shrouds are used with the wellhead box lids provided. Some user protocols specify no box lid, in these cases, piling dirt around the edges of the box works to keep Helium inside the shroud. On windy days, a plastic windscreen employed either as a cover over the shroud or as an "air dam" has provided good results. We've experimented with using yoga mat material as "gaskets" for subslab sampling with mixed results.

If you're using the lid, and we recommend you do, position the lid over the wellhead with the tubing arising through the hole in the lid. There is an audible snap when the lid is optimally attached.

### Figure 2: Helium Tracer Shroud Components




Once the shroud lid is positioned over the well, check that the 3 way valve is in the ***off*** position and the train pressure gauge showing a vacuum. This is your indication that the train is leak free since leaving the lab and all you need do is make a tight connection from the well to the open port on the 3 way valve. If the 3 way valve is not in the ***off*** position as a result of some error in shipment, there may be no vacuum on the gauge. At this point, your sampling protocols will determine whether the train can be used or not.

All trains leave the lab holding vacuum with decay rates less than 5" in 12 hours. Many shroud trains have inconsequentially slow leaks; trains are stored more than 3 days since being shipped from the lab may have no vacuum showing on the gauge. In these cases, you can check the vacuum decay rate by connecting an extra canister to the train and observing the vacuum decay rate.

## 2.0 Connecting the Well to the Train 3-port valve

To connect the soil gas well to the sampling train, you will be joining ¼" Teflon tubing to the 3 port valve. Either a ceramic or graphite ferule has been provided inside the nut on the open port of the 3 port valve for you to make this connection. The most important component in a compression fitting is the ferrule, which is prone to damage. Care should be used when installing it although if ceramic or graphite ferules become defective, it is easy to install a replacement.

A "straight" even tubing end in the ¼" OD Teflon tubing from the well to the 3 port valve is important to making a "tight" connection. Use a knife rather than scissors to cut the tubing at a 90 degree angle to the tube axis. Remove any "burrs" or irregularities in the tubing end before attempting the connection. Slip the nut over the tubing, then the ferule. The ferule should "point" toward the 3-port valve. Usually, it is not possible to install ferules "backwards".

Keeping the 3 way valve in the ***off*** position, attach the well tubing to the open 3 way valve port. Avoid excessive force when tightening the nut. If the nut is over-tightened, the ceramic or graphite ferrule frequently deforms improperly causing the joint to fail. Over-tightening is the most common cause of leaks in compression fittings. A good way to make these connections is to tighten the nut first by hand until it is too difficult to continue and then tightened the nut a full 360 degree turn with a 9/16" open end wrench; no more than a 1 and 1/4 turn should be needed to create a leak tight connection.

## 3.0 Attaching the Sample Canister to the Train

**Check the vacuum in the sample canister** using the QT Vacuum gauge, it should read -30" of Hg (full vacuum) if it reads less, use another sample canister. While keeping the 3 way valve in the ***off*** position, attach the canister to the female QT fitting at the rear of the sampling train as follows:

Pull the external sleeve of the female QT connector back to its stop, insert the male valve stem and allow the sleeve to return to its spring loaded position. When the QT connection is made the canister (male) valve is open to the train. Try to pull the canister off the train without retracting the female QT sleeve. A correctly made QT connection cannot be broken without retracting the sleeve on the female valve stem.

**A word about Micro QT Fittings**: Micro Quick connect valves (QT) offer superior performance and ease of use compared to alternative tubing connections and valves. QT fittings provide highly reliable leak free connections without tools especially for fittings that are made and broken frequently.

Fine sand and/or grit (such as dry bentonite) damages male and female QT valves and connections. Keep both male and female QT valve components scrupulously clean. Please use the orange or red plastic caps provided for the male QT fittings, they protect the valve stem while shipping and protect your sample during return shipment to the lab.

When removing or replacing orange plastic protective caps on the male QT fittings, push them straight on and pull then straight off the valve stem. Twisting the cap counterclockwise while removing or replacing on the valve stem can dissemble the valve stem causing vacuum and/or sample loss.

## 4.0 Positioning the Shroud over the Well

Position the diffusion Helium gauge out of the way on a portion of the lid that allows you a good view of the display with the shroud in place. Then invert the shroud assembly over the lid and snap lid into position.

With the shroud assembled in place, you should be able to view the vacuum gauge well enough to verify that vacuum is holding and you can see the Helium detector display. Our apologies for the opaque portions of the boxes, if you know of hard plastic boxes, with clear panels we'd love to learn about them.

## 5.0 Charging the Shroud with Helium

C&T provides Aluminum lecture bottles filled with 300 psi Helium; each bottle of Helium contains 48 liters at atmospheric pressure, enough to easily supply 20% Helium atmospheres to 6 single Shrouds and 3 double shrouds. The amount of Helium used depends predominantly on wind and time required to sample the well, with experience, you'll use less Helium. Your protocol will specify the Helium concentration in the shroud. The following guidance is based on sampling under a 20-25% Helium in air atmosphere. Regardless of your target helium concentration, your objective should be to maintain a steady concentration of Helium during the sampling event at levels above 10% Helium in air.

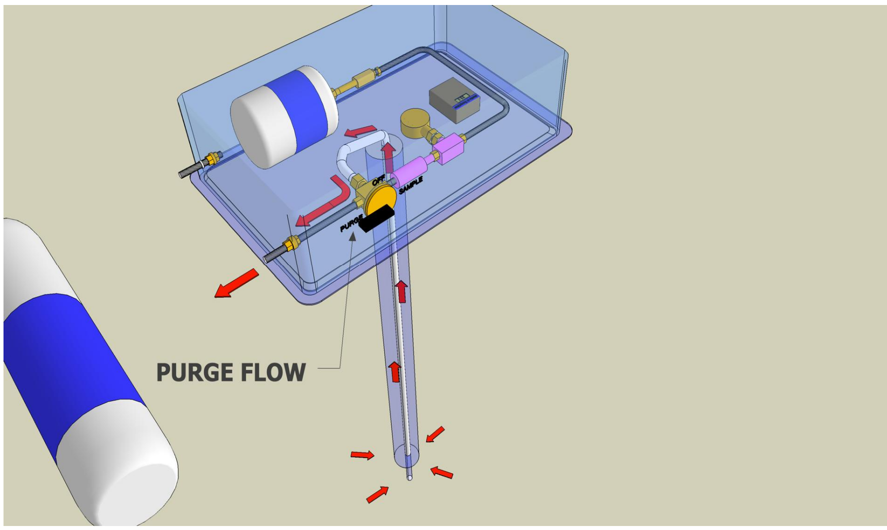
Locate and assemble the Lecture bottle, Helium transfer line, and the gas supply regulator. Tighten the brass nut attaching the regulator to the bottle one half turn past finger tight with a crescent or 9/16" open end wrench. The regulator is preset to deliver Helium at ideal pressure; ***you need not adjust the regulator***. Add Helium to the shroud by opening and closing the valve at the top of the bottle. Attach the Helium transfer line using the QT fittings at the regulator and at the Helium port on the shroud.

To provide Helium flow, slowly open the lecture bottle valve by twisting ***counterclockwise*** about ¼ turn.

Deliver 10 lbs of Helium at a time to the ***single*** shroud and 20 lbs to the ***double***. The diffusion cell Helium detector will respond in about 30 seconds to the new concentration. Unstable Helium detector readings reflect turbulent gas mixing inside the shroud. Plug holes between the shroud and the surface, use plastic sheeting to create an "air dam" or take other measures to air movement around the shroud and thus turbulence inside the shroud.

Monitor the Helium concentration displayed on the gauge in the shroud for about a minute in single shrouds, 90 seconds or longer in doubles. Under ideal conditions, 40 psi from the bottle will charge a single shroud to 25% helium concentration; double shrouds will require 80 psi. 25% Helium concentrations are maintained in the lab (zero wind) for 6-10 minutes. You may add more helium while purging and sampling. We suggest 10 psi increments for singles and 20 psi for doubles by opening the lecture bottle valve ¼ turn. We suggest users record/document the Helium concentration in the shroud at a minimum of 2 minute intervals during sampling.

### Figure 3: Purge Flow Diagram




## 6.0 Purge Testing the Well under Helium

This test will help you establish the integrity of the well and the train to well connection. If no Helium is detected in the purge gas flow using this technique, one can assume the well is tight to breakthrough, and the train connections are all tight, and thus there will be no Helium detected in the sample that goes to the lab.

While getting the Helium concentration established, assemble the well purge train. Place the inline Helium detector between the shroud and whatever device (evacuated canister, syringe, or vacuum pump) that you're using to provide purge suction.

With the Helium atmosphere established in the shroud at 20% or more, and the purge system ready to operate, begin purging by moving the 3 way valve selector position to ***Purge*** and then establishing suction on the purge line.

Observe the inline Helium detector display while applying suction on the purge line. If you've purged enough vapors from the well to represent the entire volume of the path from the surface (under Helium atmosphere) to the distal end of the sampling tube and back up the tube and through the detector without detecting any Helium, your well shows signs of integrity and you may have a good leak free sample.

CA-DTSC guidance provides the opinion that a 5% ambient air dilution is inconsequential to sample integrity. When sampling under a 20% Helium in air atmosphere, 1% Helium detected in the purge gas represents a 5% ambient air sample dilution.

## 7.0 Sampling the Well under Helium

After you've completed purging the well, verify the reading on the Vacuum gauge of the train is -30 inches and that you have a steady state concentration of Helium between 20-25%, and then begin sampling by moving the 3 way selector valve to the ***Sample*** position.

Monitor the Helium concentration in the shroud by recording the reading on the diffusion cell detector inside the shroud every other minute or so. Add Helium from the bottle as needed to maintain a steady state concentration of Helium under the shroud.

### Figure 4: Sampling Flow Diagram

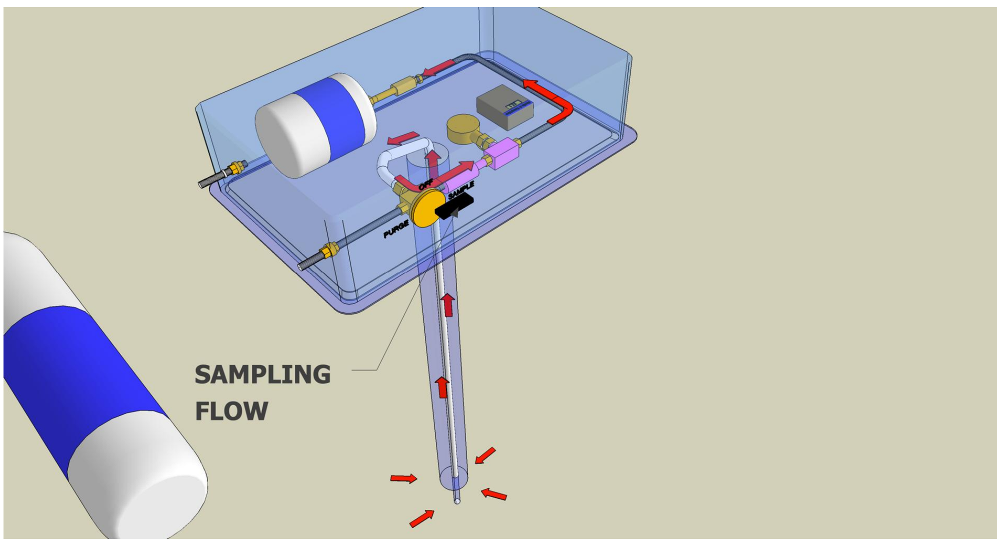


Figure 5**: Dual Depth Well Sampling Shroud**