City of Emeryville
INCORPORATED 1896
1333 Park Avenue. Emeryville, CA 94608-3517
t (510) 596-4300 | f (510) 596-4389

RECEIVED
By Alameda County Environmental Health 3:30 pm, Mar 30, 2017

March 24, 2017

Mr. Mark Detterman, PG, CEG
Senior Hazardous Materials Specialist
Alameda County Environmental Health
1131 Harbor Bay Parkway
Alameda, CA 94502

Subject: Phase II Data Gap Investigation Work Plan
for City of Emeryville Fire Station #35 (formerly #2) UST Site

Reference: Alameda County Fuel Leak Case No. RO0000061
GeoTracker Global ID T0600101925

Dear Mr. Detterman:

The City of Emeryville is pleased to submit the attached Phase II Data Gap Investigation Work Plan for the City owned Fire Station #35 (formerly #2) site. The Work Plan was prepared by OTG EnviroEngineering Solutions, Inc. (OTG) under a consultant service contract with the City of Emeryville.

Certification

I certify under penalty of law that this document and all attachments are prepared by OTG under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who managed the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Please contact Mr. Xinggang Tong at (510) 465-8982 or myself at (510) 596-3728 if you have questions or comments.

Sincerely,
City of Emeryville

NHumphrey

Nancy Humphrey
Environmental Programs Supervisor

OTG EnviroEngineering Solutions, Inc.

March 24, 2017

Mr. Mark Detterman, PG, CEG
Senior Hazardous Materials Specialist
Alameda County Environmental Health
1131 Harbor Bay Parkway
Alameda, CA 94502

Subject: Phase II Data Gap Investigation Work Plan
for City of Emeryville Fire Station #35 (formerly #2) UST Site

Reference: Alameda County Fuel Leak Case No. RO0000061
GeoTracker Global ID T0600101925

Dear Mr. Detterman:

Enclosed is a Phase II Data Gap Investigation Work Plan for the City of Emeryville Fire Station #35 (formerly #2) UST Site, which is prepared in response to a May 24, 2016 directive letter from Alameda County Environmental Health (ACEH) and a follow-up meeting with you on December 19, 2016.

Certification

I certify under penalty of law that this document and all attachments are prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who managed the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Please call Xinggang Tong at (510) 465-8982 or Nancy Humphrey at (510) 596-3728 if you have questions or comments.

Sincerely,
OTG EnviroEngineering Solutions, Inc.

Xinggang Tong, PhD, PE
Project Manager

Attachments.

Table 1 – Phase II Data Gap Investigation Work Plan
City of Emeryville Fire Station #35 (formerly #2) – GeoTracker ID T0600101925, Alameda County Fuel Leak Case #RO61

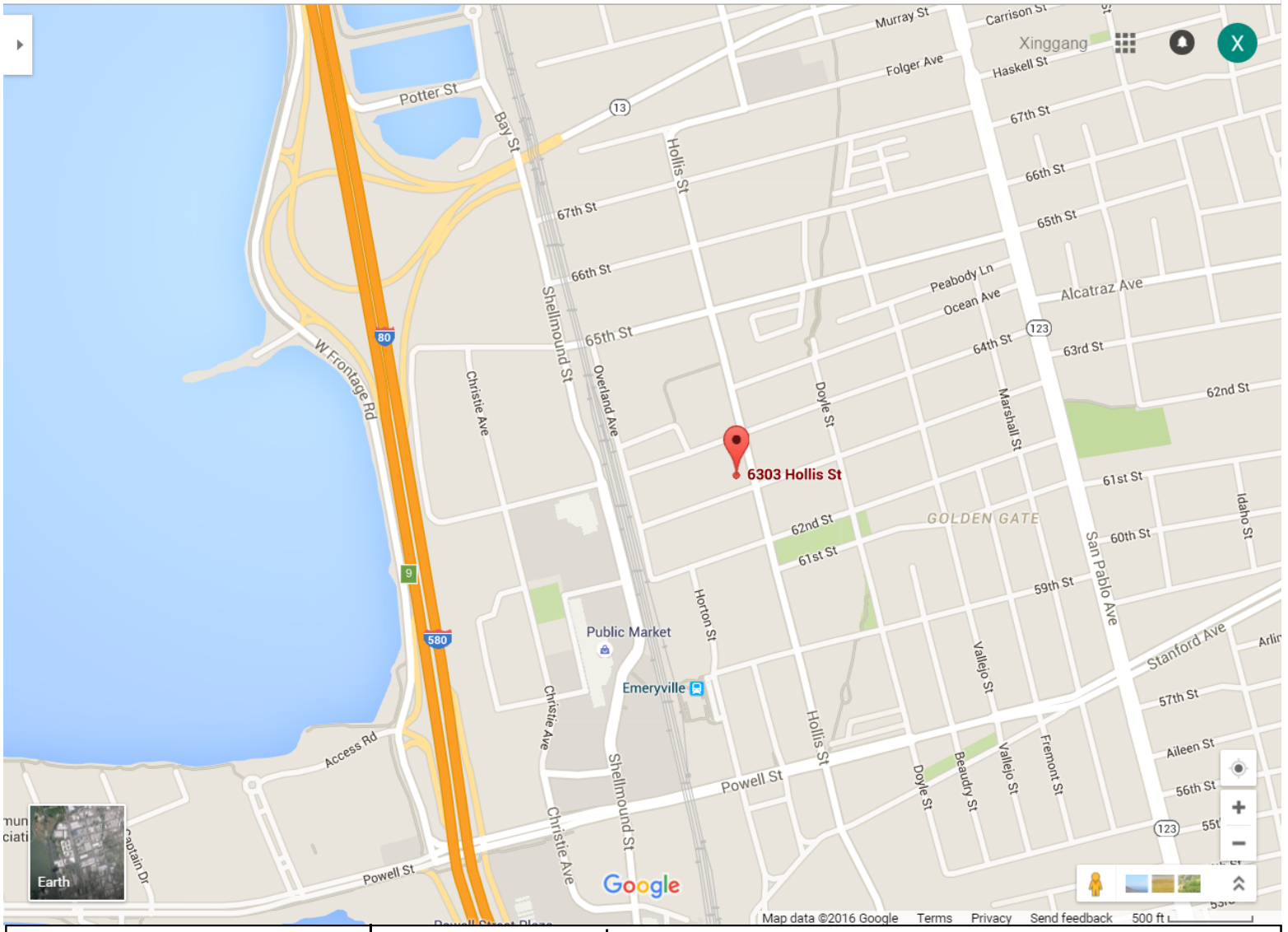
Task	Data Gap Item	Proposed Investigation	Rationale	Analyses
Task 1: LTCP General Criteria d (Free Product) – assess the nature and extent of potential LNAPL in area around SB-16				
1a	A grab groundwater sample collected from borehole SB-16 on 3/26/97 reported 29 mg/L TPH-g, which is an "indirect" evidence of LNAPL existence (> 20 mg/L TPH-g). The length of this potential LNAPL plume is undefined. Three boreholes drilled on 1/29/16 were dry, soil samples collected had TPH-g up to 490 mg/kg & TPH-d up to 94 mg/kg.	Abandon existing monitoring well MW-1. Install four new monitoring wells EW-1 through EW-4 (Figure 2). The 4 wells will be 2-inch diameter Sch 40 PVC casing, max. 20 ft deep, with 0.01" well screen from 3 ft below grade to bottom (Figure 3). Groundwater level was previously measured as high as 3 ft below grade. EW-1 will be at the same location of SB-19 & EW-2 at the same location of SB-17. No new soil samples will be collected during installation of these two wells. Soil samples will be collected for EW-3 & EW-4 installation from 0 to 5 ft & 5 to 10 ft intervals based on field observations. The 4 wells will be surveyed, developed, and monitored quarterly for one year.	• The existing monitoring well MW-1 is located in heavy traffic area; its wellhead and sealing have been compromised. It will be destroyed & replaced by EW-1, which is located off traffic area to minimize potential future damage. • EW-1 & EW-2 are located in areas where the highest TPH-g concentration has been identified in soil and grab groundwater samples • EW-3 & EW-4 are located in down gradient areas to assess the length of groundwater impact.	• Soil and groundwater samples will be analyzed for TPH-g and TPH-d by EPA Method 8015m; BTEX, MTBE & naphthalene by EPA Method 8260. • During each quarterly monitoring event, water levels (and LNAPL thickness if exists) from each well will be measured to the nearest 0.01 ft prior to purging. Groundwater flow direction map will be developed. Concentration contour maps for TPH-g, TPH-d, & benzene may also be developed when appropriate.

Table 1 – Phase II Data Gap Investigation Work Plan
City of Emeryville Fire Station #35 (formerly #2) – GeoTracker ID T0600101925, Alameda County Fuel Leak Case #RO61

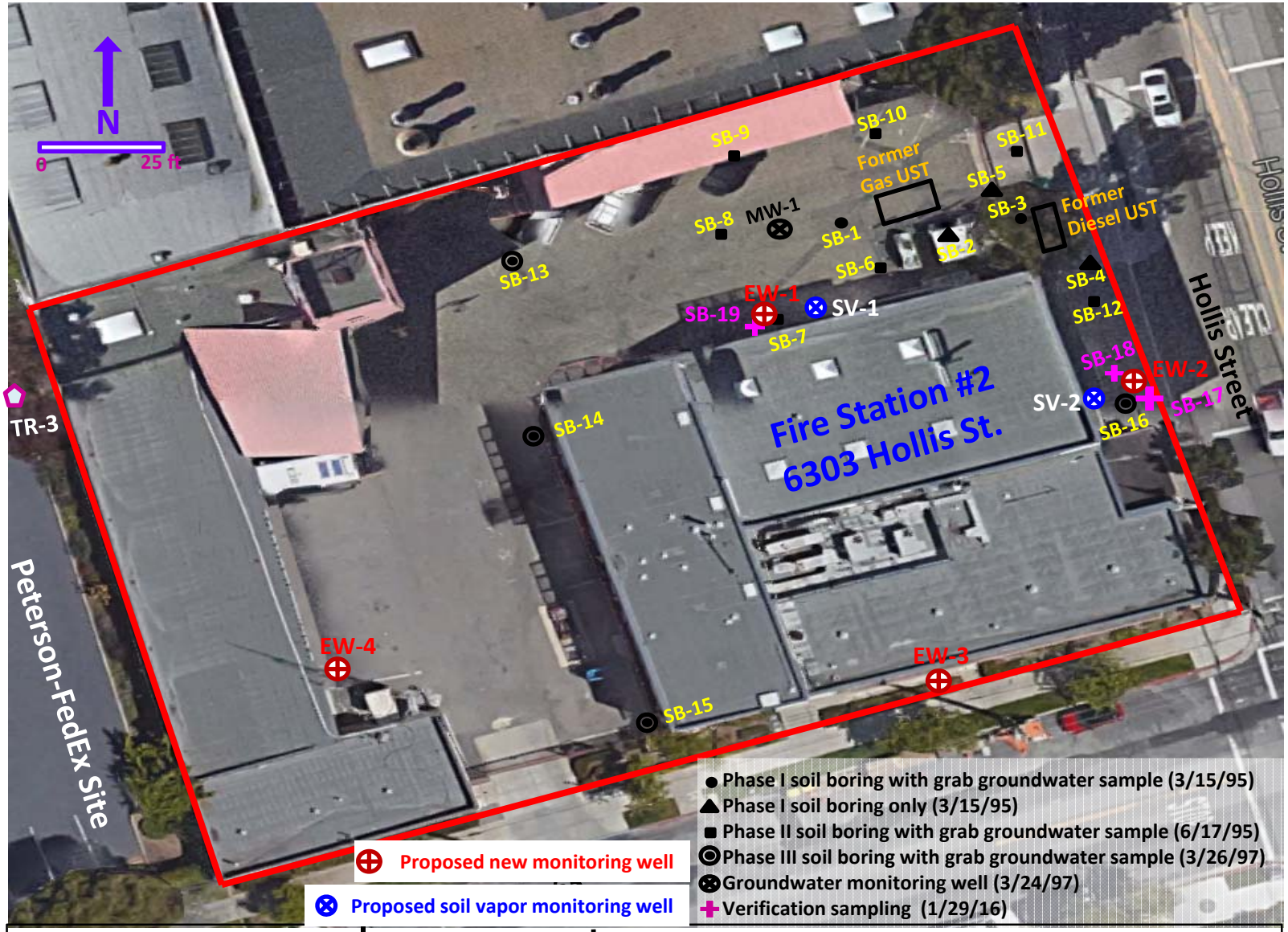
Task 2: LTCP General Criteria f – removal of secondary source to the extent practicable				
2a	The extent of removal of potential LNAPL in soil bore SB-16 is not documented.	No actions are proposed presently.	Depending on results from the groundwater monitoring program proposed under Task 1a above, appropriate removal actions could be proposed later.	
Task 3: LTCP Media Specific Criteria for Groundwater				
3a	Plume length and lateral extent not defined, nor groundwater flow direction.	See proposed actions under Task 1a.	Installation of 4 new monitoring wells as proposed under Task 1a will assist the assessment of plume length and lateral extent, and groundwater flow direction.	
3b	Limited data available to assess plume stability	See proposed actions under Task 1a.	Plume stability will be evaluated after one year of quarterly groundwater monitoring.	See analyses proposed under Task 1a
3c	Distance to closest water supply well or surface water is undetermined.	A well and surface water body survey will be conducted within ¼ mile radius of the site.		
3d	The extent of LNAPL, if present, is not defined.	Installation of 4 new wells as proposed under Task 1.a	The 4 wells are strategically located to assess both potential LNAPL and dissolved phase of plume.	The thickness of LNAPL, if exists, will be measured quarterly for one year.
Task 4: LTCP Media Specific Criteria for Vapor Intrusion to Indoor Air				

Table 1 – Phase II Data Gap Investigation Work Plan
City of Emeryville Fire Station #35 (formerly #2) – GeoTracker ID T0600101925, Alameda County Fuel Leak Case #RO61

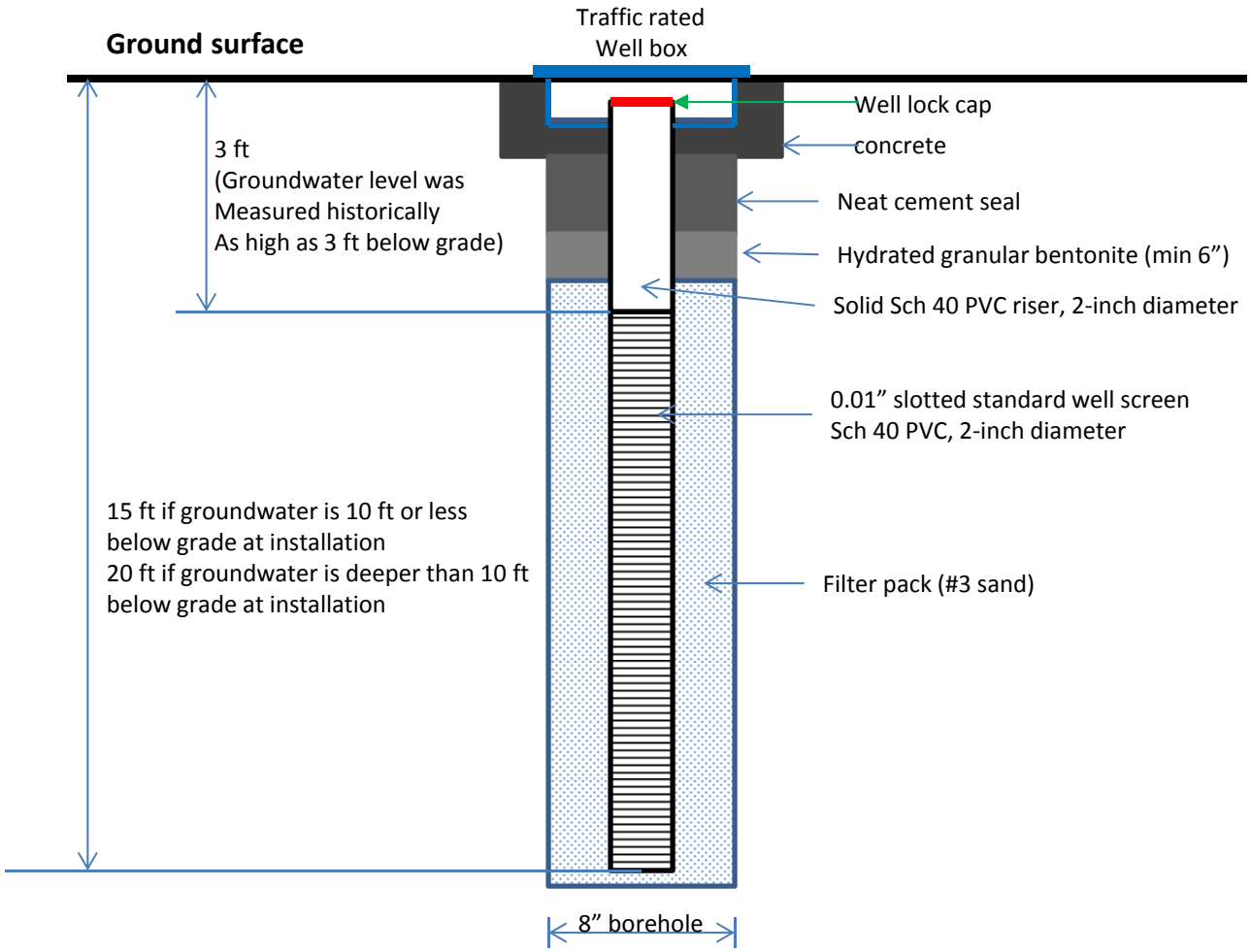
4a	Limited data available to allow assessment of vapor intrusion to indoor air.	Install 2 permanent vapor monitoring wells (SV-1 & SV-2 on Figure 2). These wells will be 5 ft deep. Details are in Appendix A. The 2 vapor wells will be monitored quarterly for one year. Field sampling protocols will follow DTSC's Final Vapor Intrusion Guidance (October 2011).	SV-1 & SV-2 are located in areas where highest TPH-g concentrations were detected in soil and groundwater. They are also located close to the building to allow assessment of potential vapor intrusion to indoor air.	Soil vapor samples will be analyzed by TO-15 for TPH-g, BTEX, & naphthalene.



EnviroEngineering Solutions, Inc.	14EMV03.2000	Figure 1. Site Location Map
	January 2016	Fire Station #2, 6303 Hollis Street, Emeryville California, 94608



OTG EnviroEngineering Solutions, Inc.	16EMV04.2000	**Figure 2**. Site Plan and Proposed Groundwater & Soil Gas Monitoring wells
	March 2017	Fire Station #2, 6303 Hollis Street, Emeryville, California, 94608



EnviroEngineering Solutions, Inc.	16EMV04.2000	**Figure 3**. Illustration of Monitoring Well Construction City of Emeryville Fire Station #35 (formerly #2)
	March 2017	6303 Hollis Street, Emeryville, California, 94608

APPENDIX A

SOIL GAS SAMPLING STANDARD OPERATING PROCEDURE

Soil gas samples will be collected adjacent to the exterior of the buildings (if buildings are present) to minimize disruption to the occupants. The soil gas sampling procedures are based on current best practice techniques and guidance provided in the following documents:

- October 2011 Department of Toxic Substances Control (DTSC) document entitled "Final Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air (Vapor Intrusion Guidance)" (DTSC, 2011);
- 21 through 22 March 2007 EPA Workshop on Soil Gas Sample Collection and Analysis, San Diego, California;
- July 2015 DTSC document entitled "Advisory – Active Soil Gas Investigations," (DTSC, 2015).

Sample Location, Density, and Analysis: Soil gas sampling locations will be proposed based on the project specific information and Work Plans. The number of soil gas samples collected for each project will be developed based on various factors, including the size of the property, characterization of source areas, and the predicted groundwater contamination plume concentration and heterogeneity.

Soil gas samples adjacent to a small structure may be collected on all four sides of the building, or, at a minimum, on the two sides closest to the source area or higher groundwater concentration area. Sampling points will be located within 5 feet of the structure, if possible, and below hard standing (paved areas) where possible.

For soil gas samples adjacent to a large commercial facility, it may not be necessary or practical to collect samples on all four sides of the facility. As an alternative, sample points may be placed in a line (at least 3 sample points) parallel to the facility on the side closest to the source or higher groundwater concentration area.

If sub-slab samples cannot be collected beneath a building, soil gas samples should be collected as close to the building foundation as possible.

At a minimum, collect the greater of one field duplicate sample per day or one field duplicate per 20 samples. Duplicate soil gas samples should be collected and analyzed using the same field collection procedures and analysis as the primary samples. Most commonly, field duplicates are obtained by collecting two samples sequentially from the same sample point. Alternatively, two samples can be collected simultaneously using a T-connector.

APPENDIX A

SOIL GAS SAMPLING STANDARD OPERATING PROCEDURE

Soil gas sampling can be completed using USEPA modified analytical methods 8260B, TO-15, TO-17, or equivalent. This operating procedure focuses on EPA Method TO-15..

Sampling procedures using EPA Method TO-15: Soil gas samples will be collected in 1-liter passivated canisters and analyzed by a NELAP- certified laboratory using EPA Method TO-15 for, at a minimum, the site-specific chemicals of concern. Batch certification of passivated canisters is acceptable for soil gas sampling. The sampling method should provide detection limits no greater than the project environmental screening levels. The samples will be analyzed with a standard turnaround time (10 business days) and the results will be reported electronically.

Soil Gas Probe Installation: Prior to any installation activities, all available sources of information regarding underground utilities should be reviewed and the selected sample locations cleared through the local Underground Service Alert utility clearance service and a private utility locator. The proposed sample locations should be adjusted as necessary to avoid potential subsurface structures and/or utilities and to minimize disturbance to sensitive landscape features. If applicable, sampling locations should be coordinated with any company or building-specific Health & Safety coordinators.

If the proposed soil gas sampling location is beneath the sidewalk, the concrete will be cored with a 8-inch diameter diamond drill bit. Each boring will be advanced to a total depth of approximately 5.5 feet below ground surface (bgs) to install the soil gas sampling probe at a target depth of 5 feet bgs. Soil gas probes may be installed at a shallower, minimum depth of 3.0 feet bgs if site conditions (i.e., shallow groundwater table) prevent installing probes at the target depth. Depending on the onsite depth of water, vertical soil gas profiling will be performed at each location, including one soil gas sample collected at 5-feet below ground surface and the other in the vadose zone (above the water table).

Once the total desired depth is reached, new, disposable, small-diameter (e.g., 1/4-inch inside diameter) Teflon® tubing, fitted with a filter at the bottom to prevent particulate infiltration will be placed at the bottom of the boring. A minimum of 12 inches of filter pack sand will be placed in the bottom of the boring and around the filter. Six inches of sand need to be placed above and below the filter. Once the sand pack is installed, a transition seal consisting of a minimum of 3 inches of dry granular bentonite will be emplaced on top of the sand pack. Once the transition seal is installed an annular seal should be installed to the surface. The composition of the annular seal is a function of the life of the soil gas probe.

Temporary soil gas wells: For wells that will be sampled for less than one year, the annular seal can be hydrated bentonite. The annular seal should be bentonite crumbles placed in approximately 2-6 inch lifts and water should slowly be added to each lift after it has been placed down the hole.

Permanent soil gas wells: For wells that will be used for longer than one year, the annular seal should be neat cement with bentonite. The bentonite content should be 1–5 percent.

A valve will be fitted to the aboveground end of the tubing and kept closed prior to purging and sampling. Following installation, a cover will be placed over each soil gas probe for probe protection prior to sampling.

Soil gas probes installed by hand augering will be allowed to equilibrate for a minimum of 48 hours

prior to purging and sampling. Soil gas probes installed using a direct-push drill rig will be allowed to equilibrate for a minimum of two hours prior to purging and sampling (DTSC, 2015).

Standard well diagram should be filled out for all soil gas probes during installation. A copy of a standard soil gas probe construction diagram is included in Attachment A

Probe Abandonment: Soil gas probes will be abandoned once the data has been validated or earlier pending local ordinances. Soil gas probes will be abandoned by pulling the probe up through the bentonite seal. Once removed, the bentonite seal will be tamped down to fill any voids in the soil left by the probe. Surface conditions will be restored to original conditions.

Sampling Soil Gas Probes: If a rain event producing greater than 0.5 inches of rain during a 24-hour period occurs, sampling will not be conducted for a minimum of five days after the event. Soil gas probes installed near irrigation lines will not be sampled until after the irrigation system has been turned off for a minimum of five days. However, soil gas sampling after rainfall can proceed where infiltration has not occurred, such as under buildings or beneath high-integrity pavement.

Prior to beginning any soil gas sampling the following should be completed a minimum of one day before entering the field:

- Review of field and sampling data should be completed and should be available during field sampling.
- Rental equipment should be inspected and tested and all rental equipment should be charged overnight prior to bringing it into the field.
- A review of the soil gas probe construction diagram should be completed and used to verify the purge volume of each probe.
- A review of sampling equipment to ensure all appropriate fittings and tubing is available.

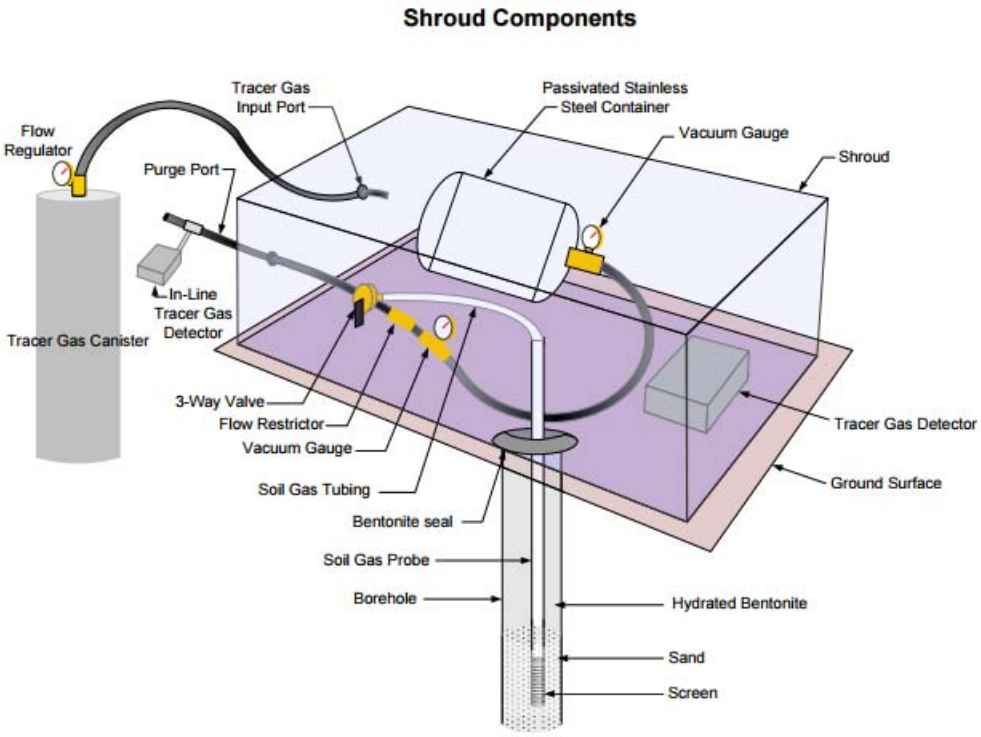
Shut-in Test Procedures: The aboveground sampling train will be subject to a shut-in test. Assemble the above-ground valves, lines and fittings downstream from the top of the probe. Ensure the valve at the top of the probe is in the closed position. Evacuate the system to a minimum measured vacuum of about 100 inches of water (7 inches of mercury) using a purge pump. The test is conducted while the sampling canister is attached with its valve in the closed position. Observe the vacuum gauge on the sampling canister for at least one minute. If there is any observable loss of vacuum, the fittings must be adjusted until the vacuum in the sample train does not noticeably dissipate. After a successful shut-in test, the sampling train must not be altered. If the sample train is altered a shut in test should be completed prior to resuming sampling.

Once the shut-in test and the purge test are complete, the soil gas samples will be collected into a 1-liter passivated canister with a flow controller capable of maintaining a flow of approximately 150 to 200 milliliters per minute (mL/minute).

APPENDIX A

SOIL GAS SAMPLING STANDARD OPERATING PROCEDURE

Figure 1: Soil Gas Sampling Train



Probe Purging, Leak Checking and Sampling Procedures: Each probe will be leak-checked using helium as a tracer compound and purged prior to sample collection. A shroud or tent will be placed to encompass all of the sampling equipment. The helium concentration inside the shroud or tent should be monitored frequently for the duration of purging and sampling to verify target concentration sand the readings must be recorded.

If the ground surface is rough and an adequate seal to the ground surface cannot be maintained a temporary seal consisting of hydrated bentonite crumbles should be used to seal the shroud or tent to the ground surface.

The following procedures will be followed:

- Place a shroud or tent over the soil gas sampling equipment.
- Visually confirm that the shroud or tent is sufficiently sealed to the ground surface.
- Introduce helium into the shroud or tent. Helium should be injected into the shroud or tent at a very low pressure; less than 1 pound per square inch. The shroud or tent will have tubing at the top of the chamber to introduce the helium into the shroud or tent and a valve

fitting at the bottom to let ambient air out while introducing the helium. Helium should continue to flow into the shroud or tent during purging. The helium concentration within the shroud or tent will be monitored with a helium tracer gas detector and maintained at a concentration two orders of magnitude higher than the reporting limit of the laboratory analytical method or the field meter used to analyze the sample. Therefore, the helium concentration within the shroud will be monitored with a handheld field helium detector and maintained at greater than 30 percent.

- Attach the sample probe tube exiting the shroud or tent to a pump that can maintain flow rates between 100 to 200 milliliters per minute (mL/min) and vacuums less than 100 inches of water, to minimize stripping (partitioning of vapors from pore water to soil gas), to prevent ambient air from diluting the soil gas samples.

- A flow rate greater than 200 mL/min may be used when purging times are excessive, such as for deep wells with larger-diameter tubing. However, a vacuum of 100 inches of water or less must be maintained during sampling whenever a higher flow rate is used. The pressure gauge used to measure vacuum should be calibrated and in good working order. When purging at rates of greater 200 mL/min, reduce the flow rate to 200 mL/min for sampling.

- Low flow conditions are conditions where a flow rate of 100 mL/min cannot be sustained under vacuum conditions up to 100 inches of water. Under such conditions a vacuum gauge should be dedicated to the well heads and purging and sampling should be completed under standard conditions up to a maximum vacuum of 100 inches of water. Once the maximum vacuum is reached the well should be closed and the vacuum dissipation should be monitored on the dedicated pressure gauge. Once the vacuum has dissipated purging and sampling should resume. This should be repeated until all purging and sampling is completed.

- Purge and leak-check the probe by:
  - Collecting samples in a Tedlar bag and screening them for helium using a hand held helium detector; or
  - Monitoring the helium concentration of the purge stream via a flow through detector.
- Prior to collecting the sample in the passivated canister. After one purge volume (internal volume of tubing plus the annular pore space around probe tip) is collected from the probe, each subsequent purge volume (at least 2) will be monitored for helium; all measurements will be recorded. The purge vacuum should not exceed 100 inches of water (7 inches of mercury).

- Additional monitoring of the purge stream using a PID and a soil gas meter may be required for specific projects. This is not a requirement and is no longer recommended by the DTSC, as state in the 2015 Advisory – Active Soil Gas Investigations.
- If the helium concentration is greater than 5 percent of the concentration measured in the shroud, the probe should be resealed. The tracer test will be performed again, and sample collection will proceed when the tracer concentration is less than 5 percent.
- After two consistent readings confirm that the probe is leak-free (less than 5 percent of the helium concentration introduced into the shroud is measured in the Tedlar bag sample), the soil gas probe will be considered properly purged and leak-free.

- Verify start vacuum in the passivated canister to be between -31 and -25 inches Hg; all measurements will be recorded. If the vacuum is low, replace the passivated canister.
- Close the canister once the vacuum has reached -5 inches Hg. Purge an additional amount of soil gas to ensure that a leak has not developed. To do so an additional soil gas sample will be collected in a Tedlar bag and monitored for helium or the concentration of helium can be monitored via a flow through detector while purging. If both the pre- and post-monitoring contain helium at a concentration less than 5 percent of the shroud concentration, then the sample will have passed the leak test. If not, additional corrective measures will be taken in the field (e.g., reseal probe) and the test will be repeated. If the 5 percent criteria cannot be met at a given probe, that location and depth will be eliminated from the sampling program.
- Helium should be included in the laboratory analyte list. The laboratory reports should quantify and annotate all detections of helium (the leak check compound) and the target analyte reporting limits.

All equipment reused during sampling must be properly decontaminated and recalibrated between sampling points, if appropriate. Tubing will not be reused; new tubing will be provided for each sampling point. Tubing and equipment will be stored in sealed bags or containers to avoid contamination prior to use.

All cells within the field form must be filled out during all projects. An example field form is included below.

Brooke Rumley and Travis Hinman are experts that should be contacted to address any problems that may arise in the field.

SOIL VAPOR PROBE CONSTRUCTION

Probe ID		Site Location	
Project Name			
Project Number		Field Personnel	

Installation Date		Borehole Diameter	1.5 - inches
Drilling Method	Direct Push	Drilling Contractor	
		Driller	

Materials Used

Tubing: [X] 0.25 Diameter (inches)

Probe Completion Time

Construction
- [X] Teflon
- [ ] Nylon
- [ ] Other

Screen: 1.5 Length (inches)
0.38 Diameter (inches)
Slot Size

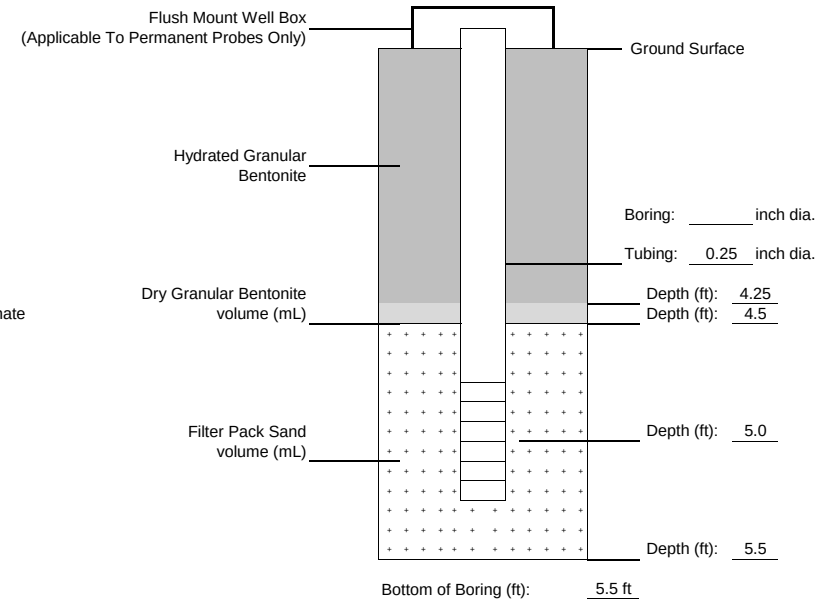
Construction
- [ ] PVC
- [ ] Stainless Steel
- [X] Other acrylic

Valve:
- [ ] Brass
- [X] Polycarbonate
- [X] 2-Way
- [ ] 3-Way
- [ ] Other

Vault:
- [ ] Flush Mount
- [ ] Above Ground

Length (inches)
Stickup (inches)

Cover Material
- [ ] PVC: temporary 4-inch slip cap
- [ ] Well Box
- [ ] Other



NOT TO SCALE