From:	York, Andrew, Env. Health
To:	"Peter Morris"; Roe, Dilan, Env. Health
Cc:	Kenneth Jones; Erin Patch; tom@grafcon.us
Subject:	RE: RO3274 Proposed Investigation - 2221 Fruitvale Ave, Oakland
Date:	Tuesday, January 02, 2018 12:18:00 PM

Good Afternoon Peter,

Thank you for your response, ACDEH understands investigation activities at this site will conducted in a phased-approach and Posada will answer ACDEH's remaining questions outlined in this email at a later date during subsequent investigation iterations. ACDEH requests that WEST address the following comments in the recently submitted table illustrating the sample depth and associated sampling and analytical methodology. These comments include:

Table 1 – Proposed Laboratory Analysis

- ACDEH requests that WEST include analysis of fixed gas for all sub slab vapor/soil gas samples, including carbon dioxide, methane, ethane/ethene, nitrogen, and oxygen.
- Due to petroleum related compounds reported in the subsurface at the site, ACDEH requests the additional analysis of naphthalene for soil and soil gas samples.

Thank you and please let me know if you have any questions, I can be reached at (510) 639-1276 or by email.

Drew York
Senior Hazardous Materials Specialist
Local Oversight & Site Cleanup Program
Alameda County Department of Environmental Health
1131 Harbor Bay Parkway
Alameda, CA 94502-6577

Ph: 510-639-1276
Fax: 510 -337-9335

PDF copies of case files can be reviewed/downloaded at:

http://www.acgov.org/aceh/lop/ust.htm

From: Peter Morris [mailto:peterm@westenvironmental.com]
Sent: Tuesday, January 02, 2018 11:01 AM
To: York, Andrew, Env. Health <Andrew.York@acgov.org>; Roe, Dilan, Env. Health <Dilan.Roe@acgov.org>
Cc: Kenneth Jones <kjones@landisdevelopment.com>; Erin Patch <epatch@unitycouncil.org>; tom@grafcon.us
Subject: RE: RO3274 Proposed Investigation - 2221 Fruitvale Ave, Oakland

Dilan/Drew:

Thank you for the comments on the upcoming investigation at 2221 Fruitvale Avenue in Oakland, California. WEST has provided responses below (blue) interlineated with your comments. We also conducted a Site visit last week to review the locations of the propped subslab vapor probes. Based on Site access, we have had to remove the two proposed subslab locations from the two resident units on the ground floor, but relocated one of the locations to the electrical room which is located in between the two residential units. We are scheduled to conduct the soil, soil gas and groundwater sampling, the groundwater monitoring well sampling and the subslab vapor probe installations this week starting Wednesday 1/3 and finishing on Friday 1/5. We will be sampling the subslab vapor probes and the groundwater monitoring wells next week on Monday 1/8 to Wednesday 1/10.

In addition, we concur with the need for additional investigations both on-Site and off-Site, following this round of sampling. However, given the time constraints to complete the sampling and the Remedial Action Plan, the additional sampling locations proposed by ACDEH will be addressed during subsequent investigation iterations.

Please call me at 415/271-0366 if you have any questions or wish to discuss further.

Peter Morris

Good Afternoon Peter,

ACDEH staff has reviewed the recently submitted figure entitled, *Data Summary, Posada De Colores, 2221 Fruitvale Avenue, Oakland, California*, dated November 2017 (electronically received on December 19, 2017). The proposed scope of work presented in the above-mentioned figure consists of the advancement of 3 groundwater monitoring wells, collection of 3 groundwater grab samples, 4 soil samples, 1 soil gas sample, and 7 sub-slab vapor samples. Methodology for the advancement (such as depth, etc) of the soil borings, soil gas, and groundwater locations was not discussed in the email correspondence. Additionally, the sample collection and analytical methodology for soil, soil gas, groundwater sampling was also not discussed in the email correspondence.

[As discussed at the meeting on December 6, 2017, WEST would provide a figure depicting the proposed sample locations discussed at the meeting; ACDEH did not require a work plan describing the sampling methodology and that the samples would be collected pursuant to WEST's Standard Operating Procedures (SOPs). On December 19, 2017, WEST provided a figure depicting the proposed sample locations and that the work would be conducted in accordance with WEST's SOPs. WEST has attached a summary table which describes the Media/Boring Type, Sample IDs, Proposed Depths; and Proposed Laboratory Analyses and corresponding analytical methods as well as our SOPs.]

Given the aggressive nature of this project and to fully characterize onsite subsurface conditions and understand potential offsite sources, ACDEH requests that WEST address the comments below.

Additionally, in an effort to expedite site characterization and health risk evaluation at the site, ACDEH notes that offsite subsurface characterization will likely be required after the City of Oakland moratorium regarding evasive work in streets due to the Holiday season has been lifted in early 2018. ACDEH's comments and requests include the following:

1. Provide a table illustrating the proposed depths of all samples and associated sampling and analytical methodology.
2. **[Please see response above]**

   a. ACDEH requests low-flow purge and sampling procedures be followed for all groundwater samples
   b. **[The groundwater samples collected from the borings and monitoring wells will be sampled using low-flow sampling techniques.]**

3. Provide a revised figure based on ACDEH requests/comments as shown in the attached figure including:
   a. Collection of the proposed sub-slab vapor sample in the maintenance room at a depth below the base of the adjacent elevator shaft. Additionally, if elevator shaft contains a sump, a groundwater sample should be collected from this location.
   b. **[At this time we do not have the plans of the existing elevator construction details nor the ability/access to advance borings beyond the base of the first floor slab. If additional information becomes available regarding the elevator construction, WEST will forward to ACDEH for discussion.]**

   c. Collection of additional soil gas samples and soil/groundwater samples east and west of the former dry-cleaning building to address historical operations outside of the former building (i.e. barrel/drum storage, etc.)
   d. **[Given the time constraints, the collection of additional soil gas samples will be addressed in subsequent investigation scope, as necessary, following review of the data collected from the proposed borings, preparation of a Conceptual Site Model and data gap analysis].**

   e. Collection of a groundwater sample from one of the proposed soil borings located inside the western portion of the former dry-cleaning building footprint.
   f. **[WEST will collect an additional groundwater sample from soil boring W-12 as depicted on the attached revised Figure 1.]**

   g. Collection of additional soil gas samples between W-5 and W-3 and between SG-3 and SG-2 to understand potential vapor partitioning from groundwater in these areas.
   h. **[Please see response to Comment 2b above].**

   i. Additional grab groundwater sample between SG-3 and SG-2 to fully understand subsurface conditions potentially from offsite sources.

j. **[Given the time constraints, the collection of additional groundwater samples will be addressed as part of a subsequent investigation scope, as necessary, following review of the data collected from the proposed monitoring wells and borings, preparation of a Conceptual Site Model and data gap analysis].**

ACDEH requests that WEST address the comments above and email ACDEH with the following items: (1) an table with sample depth and associated sampling and analytical methodology and (2) a revised figure with additionally requested sample locations.

Thank you and please let me know if you have any questions, I can be reached at (510) 639-1276 or by email.

Drew York
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-----Original Message-----
From: Peter Morris [mailto:peterm@westenvironmental.com]
Sent: Tuesday, December 19, 2017 1:28 PM
To: Roe, Dilan, Env. Health <Dilan.Roe@acgov.org>
Cc: York, Andrew, Env. Health <Andrew.York@acgov.org>; Kenneth Jones <kjones@landisdevelopment.com>; Erin Patch <epatch@unitycouncil.org>; tom@grafcon.us
Subject: RO3274 Proposed Investigation - 2221 Fruitvale Ave, Oakland

Dilan;

Per our December 6, 2017 meeting, West Environmental Services & Technology, Inc. (WEST), on behalf of the Unity Council, is providing the attached figure depicting the investigation scope for the Posada de Colores property, 2221 Fruitvale Avenue in Oakland, California. The investigation scope includes:

--Installation and sampling of three (3) groundwater monitoring wells to characterize groundwater flow direction and groundwater quality;

--Installation and sampling of seven (7) subslab vapor probes to further evaluate vapor intrusion conditions;

--Collection of soil and soil gas samples within the former dry cleaner building footprint to characterize potential source material; and

--Collection of groundwater samples to further evaluate: 1) the lateral extent of groundwater conditions to the southwest; and confirm groundwater conditions at previous boring SB-3.

The investigations will be conducted in accordance with WEST's Standard Operating Procedures. The findings from the investigations will be incorporated into the Draft Remedial Action Plan to be submitted to the Alameda County Department of Environmental Health for review.

Please call me at 415/271-066 if you have any questions or wish to discuss further.

Peter Morris

--
Peter E. Morris, P.G.
West Environmental Services & Technology, Inc.
711 Grand Avenue, Suite 220
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o.(415) 460-6770, x206
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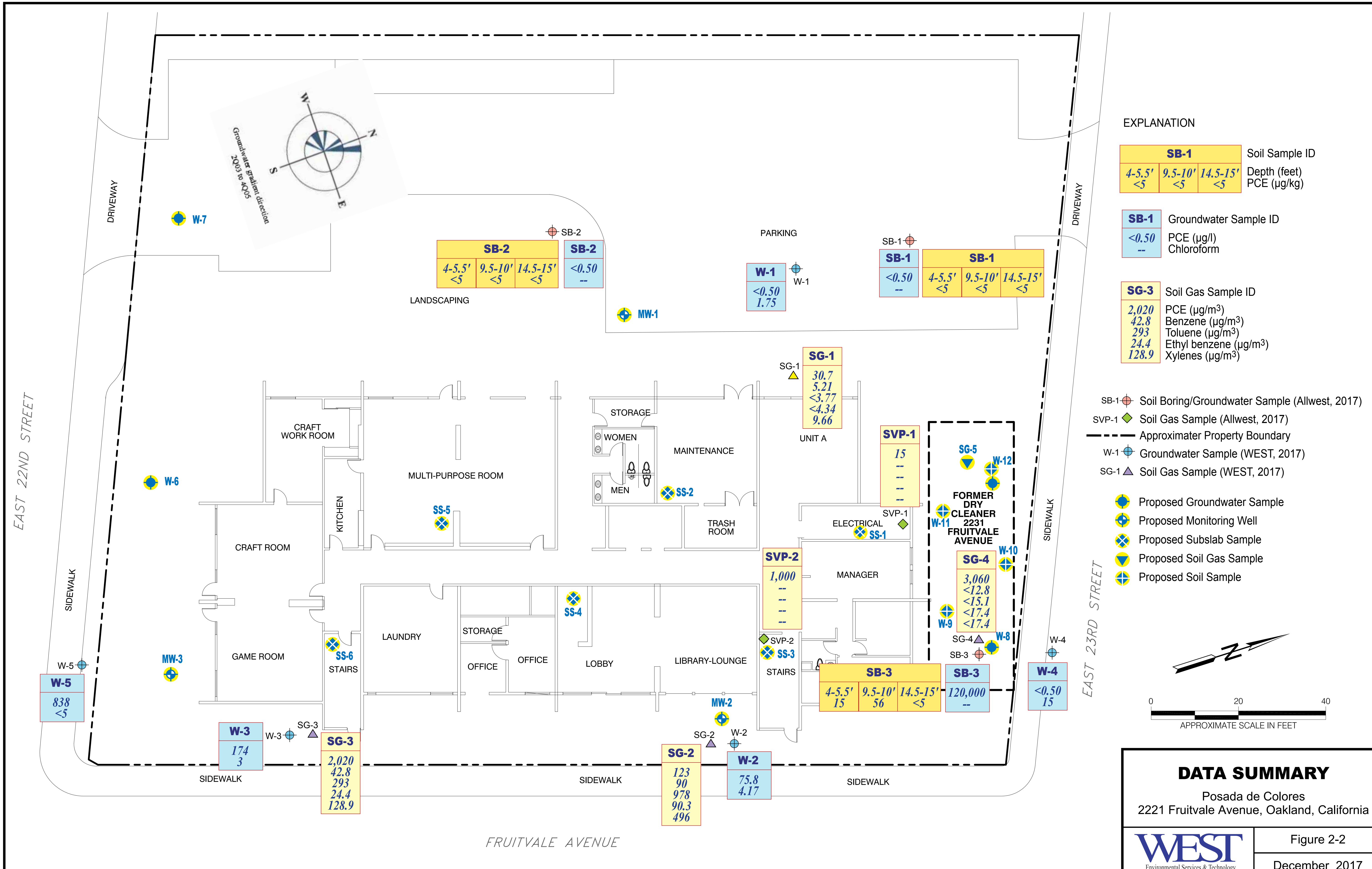

EAST 22ND STREET
EAST 23RD STREET
FRUITVALE AVENUE
DRIVEWAY
DRIVEWAY
SIDEWALK
SIDEWALK
SIDEWALK
SIDEWALK
SIDEWALK
Groundwater gradient direction 2Q03 to 4Q05
W
N
S
E
PARKING
LANDSCAPING
CRAFT WORK ROOM
MULTI-PURPOSE ROOM
STORAGE
WOMEN
MEN
MAINTENANCE
TRASH ROOM
UNIT A
ELECTRICAL
MANAGER
KITCHEN
CRAFT ROOM
GAME ROOM
LAUNDRY
STORAGE
OFFICE
OFFICE
LOBBY
LIBRARY-LOUNGE
STAIRS
STAIRS
FORMER DRY CLEANER 2231 FRUITVALE AVENUE
W-7
W-6
MW-1
MW-2
MW-3
SS-1
SS-2
SS-3
SS-4
SS-5
SS-6
SG-5
W-8
W-9
W-10
W-11
W-12
SB-2
SB-2 4-5.5' <5 9.5-10' <5 14.5-15' <5
SB-2 <0.50 --
W-1
W-1 <0.50 1.75
SB-1
SB-1 <0.50 --
SB-1 4-5.5' <5 9.5-10' <5 14.5-15' <5
SG-1
SG-1 30.7 5.21 <3.77 <4.34 9.66
SVP-1
SVP-1 15 -- -- -- --
SVP-2
SVP-2 1,000 -- -- -- --
SG-4
SG-4 3,060 <12.8 <15.1 <17.4 <17.4
SB-3
SB-3 4-5.5' 15 9.5-10' 56 14.5-15' <5
SB-3 120,000 --
W-4
W-4 <0.50 15
W-5
W-5 838 <5
W-3
W-3 174 3
SG-3
SG-3 2,020 42.8 293 24.4 128.9
SG-2
SG-2 123 90 978 90.3 496
W-2
W-2 75.8 4.17
EXPLANATION
SB-1 4-5.5' <5 9.5-10' <5 14.5-15' <5 — Soil Sample ID; Depth (feet); PCE (µg/kg)
SB-1 <0.50 -- — Groundwater Sample ID; PCE (µg/l); Chloroform
SG-3 2,020 42.8 293 24.4 128.9 — Soil Gas Sample ID; PCE (µg/m3); Benzene (µg/m3); Toluene (µg/m3); Ethyl benzene (µg/m3); Xylenes (µg/m3)
SB-1 Soil Boring/Groundwater Sample (Allwest, 2017)
SVP-1 Soil Gas Sample (Allwest, 2017)
Approximater Property Boundary
W-1 Groundwater Sample (WEST, 2017)
SG-1 Soil Gas Sample (WEST, 2017)
Proposed Groundwater Sample
Proposed Monitoring Well
Proposed Subslab Sample
Proposed Soil Gas Sample
Proposed Soil Sample
N
0 20 40
APPROXIMATE SCALE IN FEET
DATA SUMMARY
Posada de Colores
2221 Fruitvale Avenue, Oakland, California
WEST Environmental Services & Technology
Figure 2-2
December 2017

TABLE 1
PROPOSED LABORATORY ANALYSIS
2221 Fruitvale Avenue
Oakland, California

Media/ Boring Type	Sample ID	Depth (ft bgs)	Proposed Laboratory Analyses								
			VOCs	VOCs	VOCs	Helium	Nitrates/ Sulfates	Tota Iron	Ferrous Iron	Carbon dioxide	Methane/ Ethane/ Ethene
			(8260B/5030)	(8260B/5035)	(TO-15)	(ASTM D 1946)	(300)	(300)	(SM 2500)	(RSK 175)	(RSK 175)
Monitoring wells[a]	MW-1	20-30	X				X	X	X	X	X
	MW-2	20-30	X				X	X	X	X	X
	MW-3	20-30	X				X	X	X	X	X
Groundwater	W-6	20-25	X								
	W-7	20-25	X								
	W-8	20-25	X								
	W-12	20-25	X								
Subslab Vapor/ Soil Gas	SS-1	1			X	X					
	SS-2	1			X	X					
	SS-3	1			X	X					
	SS-4	1			X	X					
	SS-5	1			X	X					
	SS-6	1			X	X					
	SG-5	5			X	X					
Soil	W-9	5		X							
		10		X							
	W-10	5		X							
		10		X							
	W-11	5		X							
		10		X							
	W-12	5		X							
		10		X							

Notes:

a: Depth and construction of monitoring wells to be determined based on field geology observations

SOP-LF-1

LOW-FLOW GROUNDWATER SAMPLING

STANDARD OPERATING PPROCEDURE

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1.0 LOW FLOW GROUNDWATER SAMPLING

The purpose of the low flow purging and sampling procedure is to collect groundwater samples from monitoring wells that are representative of groundwater conditions by minimizing: disturbance of the geologic formation and in-well sediments; aeration of groundwater during sampling; and the volume of water removed during purging. Low flow sampling is performed by controlling the sampling pump flow rate to limit drawdown inside the well casing. Details of the low flow sampling protocols are presented below.

1.1 SAMPLING EQUIPMENT

Prior to the site visit, equipment and supplies will be collected that are appropriate for the site conditions and well construction. An equipment and supply checklist will be filled out prior to mobilization to the site (see Field Equipment Checklist). Details of the types of equipment needed for sample collection are provided below.

1.1.1 Extraction Devices

An extraction device will be used to collect water from the well at low flow. For wells with total depth to groundwater less than 25-feet, an adjustable rate peristaltic pump (Geotech Geopump or equivalent) will be used. For wells with groundwater deeper than 25-feet, an adjustable rate submersible pump (Geotech SS Geosub or equivalent) will be used. A water level measuring device capable of measuring to 0.01-foot accuracy using an electronic tape (Solinst Model 101 water level meter or equivalent) will be used. If non-aqueous phase liquids are anticipated, an interface probe capable of measuring non-aqueous phase liquid (NAPL) and water levels will be utilized.

1.1.2 Power Supply

A power source will be provided for the extraction device(s). For the peristaltic pump, a portable battery pack or external power source such as a car outlet or gasoline-powered portable generator may be used. For the submersible pump, a gasoline-powered portable generator will be used. This will be located downwind from the well so that exhaust fumes do not introduce potential contaminants to the groundwater samples.

1.1.3 Field Parameter Monitoring Instruments

Field parameters, including pH, electrical conductivity and temperature, will be monitored using an Oakton PCSTestr multi-parameter meter, or equivalent. Dissolved oxygen will be monitored with a YSI 550A dissolved oxygen meter and turbidity will be monitored with Hanna Instruments HI93703 portable microprocessor turbidity meter (or equivalent). In addition, oxidation-reduction potential (ORP), will be monitored with an Extech Instrument ExStik Model RE300 waterproof ORP meter (or equivalent).

1.1.4 Photoionization Detector (PID)

As appropriate, a PID instrument, the Thermo Environmental Instruments Model 580B OVM, will be used to monitor total organic vapors at the wellhead.

1.1.5 Health and Safety Equipment

For safety purposes, a reflective safety vest, steel-toed shoes and disposable nitrile gloves will be worn during groundwater sampling activities. Refer to the Health and Safety Plan for the site-specific personnel protective equipment and job hazards. The gloves will be changed between sampling of monitoring wells.

1.1.6 Equipment Calibration

Prior to groundwater sampling, monitoring equipment will be calibrated using appropriate standards. Calibration will be conducted at the beginning of the day. Maintenance checks and calibration of the equipment will be conducted according to the manufacturer's instructions. Calibration standards will be used for the turbidity meter (0 and 10 FTU solutions), for the multi-parameter meter (84 microsiemens per centimeter (μS/cm), 1,413 μS/cm, and 12,880 μS/cm solutions for electrical conductivity and 4.01 standard units (S.U.), 7.00 S.U., and 10.00 S.U. solutions for pH). A minimum of two standards will be used to bracket the measurement range for turbidity, electrical conductivity and pH. The ORP meter will be monitored using a +200 millivolts (mV; at 25 degrees Celsius) solution. The PID will be calibrated with a 100 parts per million isobutylene gas to within two-percent.

The dissolved oxygen meter will be calibrated using the elevation (Mean Sea Level) of the site, with a wet sponge at 100-percent saturation. Calibration will be documented on the Field Equipment Calibration Log (see Field Equipment Calibration Log).

1.2 SAMPLING SUPPLIES

Sampling supplies and forms will include tubing, decontamination supplies, calibration standards, sample containers and ice chest(s), flow measurement supplies, sample tags or labels, well keys, buckets, and documentation including logbook or forms and site and well details.

1.2.1 Tubing

For low flow well purge, 0.25-inch or 0.375-inch (outer diameter) disposal low-density polyethylene (LDPE) tubing will be used. When using the peristaltic pump, silastic tubing less than a foot in length will be used for the section between the rotor head and stator. The inner diameter of the silastic tubing will be less than or equal to the outer diameter of the polyethylene tubing. The silastic and LDPE tubing will be replaced between sampling of monitoring wells.

1.2.2 Decontamination

Decontamination supplies will include non-phosphate detergent, distilled/deionized water, spray bottles (one for distilled/deionized water and one for detergent and distilled/deionized water mixture) and drying supplies.

1.2.3 Sample Containers

Sample containers necessary for the analyses requested will be determined prior to site visit. Sample containers may include, but are not limited to: 40-milliliter volatile organic analysis glass vials (preserved with hydrochloric acid or unpreserved); 1-liter ambers (preserved with hydrochloric acid or unpreserved); and/or plastic bottles (in 250-milliliter, 500-milliliter, or 1-liter sizes and unpreserved or preserved with sulfuric acid, sodium hydroxide, or nitric acid). Ice chests will be used for samples requiring preservation at or below 4 degrees Celsius.

1.2.4 Miscellaneous Sampling Supplies

Additional sampling supplies that may be used during sampling include, but are not limited to: buckets to contain purge water; tools (to aid in opening well boxes and working on equipment); sample labels; freezer-grade plastic bags for individual sample bottle containment and for bagging of ice; measuring cup or graduated cylinder and stopwatch (to calculate flow rate); ice for sample preservation; umbrella for shading in summer or during rain events; appropriate well cap keys; paper towels for cleanup; traffic cones or signs; and digital camera for condition documentation, as appropriate (see Field Equipment Checklist).

1.2.5 Informational Materials and Forms

A copy of the Health and Safety Plan, monitoring well construction data, relevant work plans and/or standard operation procedures (SOPs), location map(s), field data from previous sampling event, instrument manufacturers manuals, and sampling forms will be brought for the sampling event. Sampling forms may include, but are not limited to: field notebook or field record forms; field equipment calibration form; chain-of-custody forms; and/or groundwater quality sample collection field data sheets.

1.3 PERSONNEL QUALIFICATIONS AND HEALTH AND SAFETY

All field samplers working at sites containing hazardous waste will meet the requirements of the Occupational Safety and Health Administration (OSHA) regulations. This may include the sampler being 40-hour HAZWOPER trained and 8-hour HAZWOPER refresher trained in accordance with federal OSHA regulation 29 CFR 1910.120. Field samplers will also be trained in the use of the sampling equipment either prior to use of the equipment or onsite during the sampling by trained sampler. The sampling team will read, and be familiar with the site Health and Safety Plan and relevant SOPs.

1.4 PRE-SAMPLING OBSERVATIONS

Prior to sampling, the condition of the wellhead (i.e., well casing, well lock, marking, standing water at surface, condition of surface pad, and annular seal) will be checked and observations recorded. The well cap will then be removed and total organic compound concentration will be measured at the rim of the well with a PID instrument and recorded in field notebook or on field form.

1.5 DEPTH TO WATER MEASUREMENTS

Following the pre-sampling observations, the depth to groundwater will be measured at the groundwater monitoring wells using an electronic sounding device (either the Solinst Model 101 or interface probe) from the top of the well casing to the nearest 0.01-foot, using a reference point (usually a V-cut or indelible mark placed by the surveyor). If a reference mark is not evident, magnetic north on the edge of the well casing will be used. Groundwater elevations will be calculated using the top of casing elevations surveyed to the nearest 0.01-foot above Mean Sea

Level (NAVD 1988). The water levels will be measured in the shortest possible time before purging and sampling is conducted.

1.6 GROUNDWATER SAMPLE COLLECTION METHODOLOGY

Groundwater samples will be collected from monitoring wells following the United States Environmental Protection Agency (USEPA) and Department of Toxic Substances Control (DTSC) low-flow purge and sample collection technique guidelines (USEPA, 1996; DTSC, 2008).

1.6.1 Sampling Order

Monitoring wells will be sampled in order, starting with the well expected to contain the lowest concentration of chemicals; generally, as determined from the previous sampling event results or proximity to suspected source areas. Samples will be collected and containerized at each well according to the volatility of the target analyte, starting with the most volatile (e.g., solvents and fuel constituents) and gas sensitive chemicals (e.g., Fe^{2+}, CH_4, H_2S/HS^-, alkalinity). The sequence for inorganic parameters is irrelevant unless filtered samples are to be taken, as filtered samples should be collected last.

1.6.2 Purging and Sampling Criteria

The groundwater will be purged using either a peristaltic or submersible pump outfitted with disposable LDPE tubing. The intake of the tubing or submersible pump will be placed approximately mid-screen but at least a minimum of two-feet above the bottom of the well without contacting the bottom of the well. New, clean tubing will be used for the collection of groundwater samples at each monitoring well.

Following placement of the tubing or submersible pump, water from the well casing will be purged at a flow rate ranging from 100 to 500 milliliters (ml) per minute. Groundwater parameter data including: temperature; pH; electrical conductivity; turbidity; ORP; and dissolved oxygen (DO) will be measured of the initial purge then every three to five minutes during well purging to monitor stability of parameters.

The water levels will also be monitored during purging and the pump flow rate adjusted accordingly to maintain a water level fluctuation of no more than 0.3-feet. "During the pump start-up, drawdown may exceed the 0.3-feet target and then recover as flow adjustments are made. Adjustments should be made within the first fifteen minutes of pumping in order to help minimize the purge time" (USEPA, 2010). "At a minimum, four parameter stabilization measurements should be recorded while purging" (DTSC, 2008). If the minimal drawdown that can be achieved exceeds 0.3-feet during pump start-up, but then remains stable, pumping will continue until field parameters stabilize. The volume of groundwater to be purged must be greater than the stabilized drawdown volume plus the tubing volume. If the drawdown has exceeded 0.3-feet and stabilizes, the final volume of groundwater to be purged must be greater than the volume of water between the initial water level and the stabilized water level plus the volume of water in the tubing (USEPA, 2010).

Where groundwater does not stabilize, remove a minimum of three well casing volumes prior to sample collection (DTSC, 2008). In the event the well is purged dry, groundwater samples should be collected "as soon as a sufficient volume of groundwater has entered the well to enable collection of the necessary groundwater samples. Re-purging should be performed if a well is inactive for more than 24-hours after full recharge" (DTSC, 2008). If wells consistently purge dry, evaluate the use of passive sampling methods for future groundwater-monitoring events.

1.6.3 Sample Collection

Groundwater samples will then be collected into laboratory supplied sample containers with the appropriate preservatives once the indicator parameters measured during purging have stabilized for three consecutive readings, as follows: plus/minus 3-percent for temperature (minimum of plus/minus 0.2 degrees Celsius); plus/minus 0.1 Standard Units (S.U.) for pH; plus/minus 3-

percent for specific conductance; plus/minus 10 millivolts for ORP; and plus/minus 0.3 milligrams per liter for DO (DTSC, 2008).

Following parameter stabilization, groundwater samples for laboratory analysis will be collected into the sample containers by directing the flow from the discharge tubing along the container sides to minimize aeration. The sample containers will be filled to the top of the container rim then capped. For groundwater samples collected into 40-milliters volatile organic analysis (VOA) vials preserved with hydrochloric acid, remove the cap and fill, taking care not to overflow and lose preservative. Place the cap on each VOA and then turn upside down to check for air bubbles. If bubbles are present, discard and collect groundwater samples into new VOAs. If a VOA appears to effervesce when collected into a VOA preserved with hydrochloric acid, a new sample will be collected into an unpreserved container and checked for air bubbles.

1.6.4 Sample Preservation, Storage, and Quality Control

Preservatives used in sample collection will be recorded on field data forms. Following sample collection, the samples will be labeled, placed in a chilled cooler with ice (to maintain temperature at or below 4 degree Celsius) and transported to a primary California Department of Public Health (CDPH) Environmental Laboratory Accreditation Program (ELAP) certified laboratory for chemical analysis following the chain-of-custody procedures outlined in ASTM D 4840. Trip blanks and equipment blanks, as appropriate, will be transported with the primary samples for chemical analysis. A duplicate sample will also be collected and submitted to a secondary CDPH ELAP certified laboratory, for chemical analysis following the chain-of-custody procedures outlined in ASTM D 4840.

1.7 DECONTAMINATION

All non-disposable sampling equipment will be decontaminated prior to use in the first well and then each well following. If using a submersible pump, decontaminating solutions will be pumped from buckets with a non-phosphate detergent solution then flushed with potable or distilled/deionized water to remove detergent solution. Water level and well depth measurement equipment will be decontaminated prior to use at each well.

1.8 MANAGEMENT OF INVESTIGATION-DERIVED WASTES

Investigation-derived wastes (IDWs), those materials generated during the process of sampling at the site will be managed in accordance with applicable regulatory requirements. IDWs are anticipated to include: groundwater, decontamination fluids, personal protective equipment (PPE) and disposable sampling equipment.

Management of IDW must comply with applicable regulations. Potential applicable regulations include: the Resource Conservation and Recovery Act (RCRA), Clean Air Act (CAA), Clean Water Act (CWA), Safe Drinking Water Act (SDWA) and legally enforceable state regulations.

Waste generated during implementation of the work will be containerized in United States Department of Transportation (USDOT)-approved containers, labeled and stored in a secure area at the site. The containers will be labeled including USEPA generator ID, generator contact information, accumulation date and type of waste. The IDWs will then be characterized to determine appropriate waste disposal options.

2.0 REFERENCES

ASTM, *Standard Guide for Sample Chain-of-Custody Procedures D 4840-99* (ASTM D 4840).

California Environmental Protection Agency, Department of Toxic Substances Control, *Representative Sampling for Groundwater for Hazardous Substances. Guidance Manual for Groundwater Investigations*, July 1995, Revised February 2008 (DTSC, 2008).

USEPA, *Low-Flow (Minimal Drawdown) Ground-water Sampling Procedures, Office of Research and Development, Washington D.C., EPA/540/S-95/504,* April 1996 (USEPA, 1996).

USEPA, Ground-Water Sampling Guidelines for Superfund and RCRA Project Managers, EPA 542-S-02-001, May 2002(USEPA, 2002).

USEPA, *Low Stress (low flow) Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells*. Regional 1 Low-Stress (Low-Flow) SOP, EQASOP-GW 001, July 30 1996, Revised January 19, 2010.

WEST
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FIELD EQUIPMENT CHECKLIST

Project: ______________________________ **Date:** ______________________

Need	*Have*	**Safety Equipment**
		gloves (work and nitrile)
		hard hat
		steel-toe safety shoes
		respirator
		reflective safety vest
		Tyvek suit

Need	*Have*	**Sampling Equipment**
		PID (Model 580B OVM) w/ calibration kit + charger
		Dust monitor (Thermoscientific pDR-100AN)
		Hand auger kit
		Sample pole/cup holder
		Peristaltic pump (Geotech Geopump) & battery pack
		Submersible pump (Geotech SS Geosub Pump) &Reel
		Pump controller (Geotech SS Geosub) & 2 Cables
		Generator
		Interface probe
		Water level meter (Solinst Model 101)
		Dissolved Oxygen meter (YSI 550A)
		Temp., pH, EC meter (Oakton PCSTestr)
		ORP meter (Ectech ExStik Model RE300)
		Turbidity meter (Hanna Instruments HI 93703)
		Power supply/battery
		Helium shroud (soil gas)
		Helium detector (soil gas)

Need	*Have*	**Sample Containers**
		Summa canisters (1L/6L) ______ (soil gas)
		Manifolds w/ vacuum meter _____ (soil gas)
		Brass liners/end caps (soil)
		Glass jars w/ teflon-lined lids (soil)
		VOAs-preserved/unpreserved (water)
		Ambers (water)
		Plastic-sizes:___________________(water)
		5 gallon jug (water)
		Trip Blank (water)

Need	*Have*	**Documentation**
		Field Notebook/Field Record
		COCs
		Field Data Sheets (types:______________________)
		Work Plan (Document:________________________________)
		HASP
		Boring Logs

Need	*Have*	**Supplies**
		Buckets/drums ____/____
		Paper towels
		Cooler/ice
		Wrench set
		Sample labels
		Tubing (tygon, 1/4", 3/8", 1/2")
		Distilled/deionized water
		Calibration standards
		Baggies
		Toolbox
		Bailers
		Batteries (9V/AA/AAA)
		Pens/Markers
		Measuring wheel/tape
		USA paint
		Drum labels
		Bolt Cutters
		Spray bottles/alconox
		Garbage bags
		Well key (dolphin)
		Traffic cones/signs ____/____
		String
		Drum spanner
		Locking caps/locks
		Measuring cylinder
		Digital camera
		Clipboard
		Encore samplers/T-handle
		Soil color/classification book
		Helium Tank(s)___ (soil gas)
		Helium tank regulator (soil gas)
		Flow board/meter (soil gas)
		Manifold connectors/ferrels

Reviewed:_____________

Approved:_____________

WEST
Environmental Services & Technology

Field Equipment Calibration Log

Project: ____ Date: ____________________________

Monitoring Event:____

Calibrated by:____________________

Equipment	Calibration Standards	Initial Calibration Value	Temp. (°C)	End of Day Calibration Value	Temp. (°C)	Remarks
Thermo Scientific 580B PID	0 ppmv (ambient air)	ppmv		ppmv		
	100-ppmv (isobutylene)	ppmv		ppmv		
YSI Dissolved Oxygen	100% saturation (wet paper towel or sponge)	%		%		
(Elevation:_______ft)		%		%		
Oakton PCTestr 35 - EC	84 µS/cm	µS/cm		µS/cm		
SN#747808; Unit 1	1,413 µS/cm	µS/cm		µS/cm		
	12.88 mS/cm	mS/cm		mS/cm		
Oakton PCTestr 35 - pH	pH 4.01 S.U.	S.U.		S.U.		
SN#747808; Unit 1	pH 7.00 S.U.	S.U.		S.U.		
	pH 10.00 S.U.	S.U.		S.U.		
Oakton PCSTestr 35 - EC	84 µS/cm	µS/cm		µS/cm		
SN#754005; Unit 2	1,413 µS/cm	µS/cm		µS/cm		
	12.88 mS/cm	mS/cm		mS/cm		
Oakton PCSTestr 35 - pH	pH 4.01 S.U.	S.U.		S.U.		
SN#754005; Unit 2	pH 7.00 S.U.	S.U.		S.U.		
	pH 10.00 S.U.	S.U.		S.U.		
EXTECH ORP SN#124344	+200 mV (at 25 degrees C)	mV		mV		
EXTECH ORP SN#124338	+200 mV (at 25 degrees C)	mV		mV		
Hanna Turbidity	0 FTU (DI water or standard)	FTU		FTU		
	10 FTU	FTU		FTU		

SOP-WI-1

STANDARD OPERATING PROCEDURE

WELL INSTALLATION

STANDARD OPERATING PROCEDURE – WI-1

Well installations including, soil vapor monitoring wells, soil vapor extraction (SVE) wells and groundwater monitoring wells will be performed by a California C-57 licensed well drilling contractor in accordance with the local permitting agency's requirements and the methodology summarized below. Construction of the wells will be detailed on well construction diagrams.

PERMITTING

Prior to well installation, permits will be obtained from local permitting agency, and notification of work start dates will be provided to the overseeing and permitting agencies (as applicable).

HEALTH AND SAFETY AND UTILITY CLEARANCE

A Site-specific *Health and Safety Plan* ("*HASP*") will be prepared to address worker health and safety during well installation activities. The *HASP* will be prepared in accordance with the California Occupational Health and Safety Administration (CalOSHA) Title 8 §5192 Hazardous Waste Operations and Emergency Response and United States OSHA 29 CFR 1910.120, Hazardous Waste Operations and Emergency Responses. The *HASP* will be approved by the Project Manager, a Quality Assurance Reviewer and the on-site Safety Officer. The *HASP* will be read and signed by all on-site workers and site visitors prior to entering the work area.

Pursuant to California Assembly Bill AB 73, Underground Services Alert (USA) will be contacted to locate and clear work areas for underground utilities at the site. The work areas will also be cleared for underground utilities using a private underground utility locating contractor.

DRILLING METHODS

Hand Auger

Hand-auger drilling method uses a hand-auger barrel to drill an open borehole on the ground. The hand-auger barrel is turned and pushed manually (or with the assistance of a small electric or gasoline power unit) into the ground and short extension rods are added to it as necessary to reach the target depth. When the auger head is full of geologic material, the auger head is retrieved from the borehole, emptied, and the process is repeated.

Hollow Stem Auger

Hollow-stem auger drilling method uses continuous flight hollow stem auger with a bit on the bottom to drill and maintain an open borehole. The borehole is advanced by pushing and rotating at low velocity the initial auger drilling rod into the ground and adding additional drilling rods as necessary to reach the target depth. The continuous flight auger drives the drill cuttings to the surface as drilling progresses. The walls of the augers minimize the amount of unconsolidated materials entering into the space inside the casing. Hollow stem augers are equipped with core barrels for collecting continuous samples of unconsolidated materials. The amount of each material used should be recorded in the field logbook.

Direct Push

Direct push technology uses a GeoProbe® drill rig to hydraulically push macro-core® or Dual Tube® probes into the subsurface. The probes compress and rearrange soil particles to permit advancement of the probes, rather than creating soil cuttings. The advantage of using a Georpobe® over other drilling techniques, e.g., hollow stem auger, is reduced investigation derived waste and the ability to collect continuous cores.

SOIL BORINGS

Borings will be advanced at pre-determined locations for installation of wells. The borings will be drilled by a California C-57 licensed well drilling contractor using one of the methodologies described above. The annular seal will be constructed pursuant to permit requirements.

Soil cores will be collected for lithologic characterization from drill cuttings or conituously. The down-hole reusable sampling equipment will be decontaminated prior to reuse at each sampling location. Descriptions of the subsurface lithology will be recorded on boring logs using the Unified Soil Classification System (USCS) and Munsell Color Index.

The soil cores will be field screened using a Thermo Environmental, Inc. 580B photoionization detector (PID) equipped with a 10.6 electron Volt (eV) lamp calibrated to 100 parts per million by volume (ppm_v) with isobutylene gas for organic vapors using closed headspace techniques. The results of the field screening will be recorded on the boring logs. Upon completion of each boring, groundwater-monitoring wells will be constructed within the borings.

SOIL SAMPLING

Soil samples for laboratory analyses will be collected from target depths using stainless steel split-spoon samplers or core barrels outfitted with brass, stainless steel or acetate liners driven into the subsurface using the drilling equipment. The liners will then be removed from the split-spoon samplers or core barrels. The ends of the liners will then be covered with Teflon sheets and plastic end caps, labeled and placed in a chilled cooler for transportation to a California Department of Public Health (CDPH) Environmental Laboratory Accreditation Program (ELAP) certified laboratory for chemical analyses following ASTM D4640 chain-of-custody protocols.

INSTALLATION OF WELLS

Following soil boring advancement, the wells will be constructed in the borehole annulus. The well construction materials will be comprised of: PVC, CPVC or stainless steel well casing; or polyethylene, Teflon or Nylaflow tubing, as depicted on well construction diagrams. An appropriate well screen and sand filter pack will be selected based on geologic materials encountered during the advancement of soil borings. The sand filter pack will be placed within the annulus between the well screen and the borehole wall to a minimum one-foot above the well screen or as depicted on well construction diagrams. The top of the well screens will be outfitted with blank well casing or tubing to the ground surface. A minimum two-foot seal consisting of bentonite pellets will be placed above the well screen and allowed to hydrate for at least 30 minutes prior to placing the annular seal. A Portland cement grout sanitary seal will be placed above the bentonite seal to the ground surface using a tremie pipe. The top of the wells will be completed with a traffic-rated flush-mount steel protective box and locking cap for security.

Downhole equipment will be decontaminated before commencement of drilling activities and between the boring locations. Soil cuttings generated during drilling activities will be placed in United States Department of Transportation (USDOT)-approved 55-gallon steel drums or roll-off bins. The soil cuttings will be sampled for chemical analysis and profiling by the disposal facility for acceptance. The 55-gallon drums or roll-off bins will be labeled and temporarily stored at the site pending analytical review of the soil cutting samples. The disposition of the soil cuttings will be determined following receipt of soil cutting sample analytical results and acceptance by the disposal facility.

WELL DEVELOPMENT

For groundwater monitoring wells, at least 72-hours following construction, the monitoring wells will be developed to remove suspended materials generated during the drilling activities. Well development will consist of inserting a surge block equipped with a wiper within the well casing and surging the water to flush suspended material through the sand filter pack. Following surging activities, the water within the well casing will be purged using a submersible pump or bailer.

Groundwater quality parameters including temperature, pH, conductivity and turbidity will be monitored during the well purging activities. The groundwater will be purged from the well until water quality parameters have stabilized to within approximately 10 percent of the previous measurements. Well development purge water will be placed within USDOT-approved 55-gallon steel drums, labeled and temporarily stored at the site. Disposal of well development water will be arranged following receipt of groundwater sampling analytical results.

WELL SURVEY

Following installation of groundwater monitoring wells, the elevations of the top of the well casings will be surveyed by a California State licensed land surveyor to the nearest 0.01-foot above Mean Sea Level (MSL) using the North American Vertical Datum of 1988 (NAVD 1998). The well elevation survey will be used to calculate the groundwater elevation at each monitoring well location for determination of groundwater flow direction and gradient.

DEPARTMENT OF WATER RESOURCES WELL COMPLETION REPORTS

Pursuant to California Water Code Section 13751, well completion reports will be filed with the California Department of Water Resources within 60-days of the well construction (DWR, 1999).

SOP-SG-1

STANDARD OPERATING PROCEDURE

SOIL GAS WELL SAMPLING

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1.0 PRE-FIELD ACTIVITIES

Prior to conducting sampling, the following pre-field activities will be conducted.

1.1 PERSONNEL QUALIFICATIONS AND HEALTH AND SAFETY

All field samplers working at sites containing hazardous waste will meet the requirements of the Occupational Safety and Health Administration (OSHA) regulations. This may include the sampler being 40-hour HAZWOPER trained and 8-hour HAZWOPER refresher trained in accordance with federal OSHA regulation 29 CFR 1910.120. Field samplers will also be trained in the use of the sampling equipment either prior to use of the equipment or onsite during the sampling by trained sampler. The sampling team will read, and be familiar with the site Health and Safety Plan and relevant standard operating procedures (SOPs).

1.1.1 Health and Safety Equipment

For safety purposes, a reflective safety vest, steel-toed shoes and disposable nitrile gloves will be worn during sampling activities. Refer to the Health and Safety Plan for the site-specific personnel protective equipment and job hazards. The gloves will be changed between sampling locations.

1.1.1.1 PHOTOIONIZATION DETECTOR

Total organic vapors will be monitored using a photoionization detector (PID) equipped with a 10.6 electron volt (eV) lamp and calibrated to 100 parts per million by volume (ppm_v) using isobutylene gas.

1.2 SAMPLING SUPPLIES

Sampling supplies and forms will include sample containers, sample tags or labels, and documentation including logbook or forms and site details.

1.2.1 Informational Materials and Forms

A copy of the Health and Safety Plan, monitoring well construction data, relevant work plans and/or SOPs, location map(s), field data from previous sampling event, and sampling forms will be brought for the sampling event. Sampling forms may include, but are not limited to: field notebook or field record forms; chain-of-custody forms; and/or sample collection field data sheets.

1.3 PRE-SAMPLING OBSERVATIONS

Prior to sampling, the condition of the vapor wells will be checked and observations recorded. If repairs are needed, appropriate personnel will be notified and the wells repaired prior to sampling.

2.0 SAMPLE COLLECTION

The purpose of the vapor well sampling procedure is to collect samples from existing vapor wells that are representative of conditions. Details of the vapor well sampling protocols are presented below.

2.1 APPLICABLE GUIDANCE

Vapor samples will be collected following the October 2011 California Environmental Protection Agency's (CalEPA) Department of Toxic Substances Control (DTSC) *Final Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air* (*Vapor Intrusion Guidance*) and CalEPA's 2015 *Advisory Active Soil Gas Investigation* and whole gas sampling technique as outlined in ASTM D 5466 *Standard Test Method for Determination of Volatile Organic Chemicals in Atmospheres – Canister Sampling Methodology* (ASTM D 5466).

2.2 SAMPLING EQUIPMENT

Prior to the site visit, equipment and supplies will be collected that are appropriate for the site conditions. An equipment and supply checklist will be filled out prior to mobilization to the site. Details of the types of equipment needed for sample collection are provided below.

2.2.1 Sampling Devices

The vapor well samples collected using Summa canister whole gas sampling technique will be conducted as outlined in ASTM D 5466. The crawlspace samples will be collected using laboratory-prepared one-liter passivated stainless steel Summa canisters delivered by the analytical laboratory with approximately 30-inches of mercury vacuum. The vacuum within the Summa canisters will be measured before sample collection to document the canister atmosphere.

The vapor well samples collected using sorbent tube sampling technique will be conducted as outlined in USEPA Compendium Method TO-17 (Method TO-17).

2.3 LEAK TESTING

Before obtaining soil gas samples, leak tests will be conducted. Details of the types of leak tests to be conducted are presented below.

2.3.1 "Shut-In" Test

Prior to purging or sampling soil gas, a test will be conducted to check for leaks in the aboveground fittings, i.e., "shut-in" test. The shut-in test will consist of assembling the above ground apparatus (e.g., valves, lines and fittings downstream from the top of the probe), and evacuating the lines to a measured vacuum of approximately 100-inches of water column, then shutting the vacuum with closed valves on opposite ends of the sampling equipment. The vacuum gauge connected to the line via "T"-fitting will be observed for at least one minute and if there is observable loss of vacuum, the fittings will be adjusted, as needed, until the vacuum in the aboveground portion of the sampling equipment does not dissipate.

2.3.2 Quantitative Leak Testing in the Probe and Sampling Train

Following the "shut-in" test, helium will be applied at the connections of the sampling equipment including valves, gauges, tubing, manifold and sample container. Helium will be used for leak tracer testing by placing a shroud over the probe and sampling equipment. Helium will be released into the shroud and a handheld helium detector will be used to monitor and maintain a reasonably steady concentration, which will be recorded on field data forms. The helium concentration in the shroud will be at least 10-percent or two orders of magnitude higher than the reporting-limit of the field meter used to analyze the sample. Laboratory analysis of the soil gas samples will include testing for helium gas. The analysis of the tracer compound will be used to assess leakage.

2.4 SAMPLE COLLECTION

Following purging activities, the tubing will then be attached to an analytical laboratory-prepared one-liter Summa canister or sorbent tube. The Summa canisters will be delivered by the analytical laboratory with a vacuum of approximately 30-inches of mercury and outfitted with 0.125-liter per minute flow control valve. The tubing will be connected to the Summa canister or sorbent tube using airtight fittings. The flow control valve on the Summa will be opened slowly to draw the vapor sample from the target depth. For sorbent tube sampling, tubing will be connected to as peristaltic pump with a flow rate between 50ml/min to 200 ml/min (dependant on sorbent tube type; for typical flow rates see attached Method TO-17). Following sample collection, the Summa canister atmosphere will be measured with a vacuum gauge and recorded on field data forms. Flow rates and duration for sorbent tube sampling will be recorded on field data forms.

The Summa canisters and/or sorbent tubes will then be labeled and transported to a California Department of Public Health (CDPH) Environmental Laboratory Accreditation Program (ELAP) certified laboratory pursuant to ASTM D 4840 chain-of-custody protocols.

If low-flow or no-flow conditions (e.g., fine-grained soil, clay, soil with vacuum readings that exceed approximately 10-inches of mercury or 136 inches of water) are encountered, and low-flow sampling is not successful, soil matrix sampling using EPA Method 5035A and analysis using United States Environmental Protection Agency (USEPA) 8260B will be conducted (DTSC, 2011).

2.5 LABORATORY ANALYSIS

Once the sampling has been completed, the samples will be transported to the laboratory following the chain-of-custody procedures outlined in ASTM D 4840 for chemical analysis using USEPA Method TO-15 (summa canisters) or USEPA TO-17 (sorbent tubes). The laboratory will be advised to conduct analysis of the whole gas samples within 30-days of receipt.

2.6 QUALITY CONTROL

Analytical data will be subject to quality control review and validation by both the laboratory and prior to completion of the report by WEST. A data quality usability evaluation will be conducted and will incorporate the following: (1) review of laboratory reports; (2) documentation of geographic location of samples and sampling procedures; (3) whether data are representative of Site conditions; (4) appropriateness of laboratory analytical methods and detection limits; and (5) laboratory surrogate recovery, method blank data, precision and accuracy.

The laboratory quality assurance will included a review of method blanks, matrix spike recovery; matrix spike duplicates; and sample hold times. Field sampling and transportation procedures will also be reviewed for: sample collection methodology; sample containers; sample storage; and sample duplicates.

3.0 REFERENCES

ASTM, *Standard Guide for Sample Chain-of-Custody Procedures D 4840-99* (ASTM D 4840).

ASTM, *Standard Test Method for Determination of Volatile Organic Chemicals in Atmospheres - Canister Sampling Methodology* (ASTM D 5466).

CalEPA, *Advisory Active Soil Gas Investigation*, July 2015 (CalEPA, 2015).

DTSC, *Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air (Vapor Intrusion Guidance)*, October 2011 (DTSC, 2011).

USEPA, *Compendium Method TO-17, Determination of Volatile Organic Compounds in Ambient Air Using Active Sampling Onto Sorbent Tubes, EPA/625/R-96/010b*, January 1999 (USEPA, 1999).