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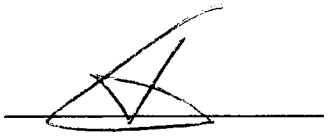
By Alameda County Environmental Health 11:01 am, Jun 22, 2017

PERJURY STATEMENT

Subject: Fuel Lake Case No. Ro0002981 and Geotracker Clobal ID T1000000416, Red Hanger Cleaners, 6335-6339 College Ave., Oakland, CA 94618

" I declare, under penalty of perjury, that the information and/or recommendations contained in the attached document or report is true and correct to the best of my knowledge."



Ron Elvidge
College/Claremont Venture, LLC

June 19, 2017

Keith Nowell
Alameda County Health Services Agency (County)
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502-6577

Re: Supplemental Remedial Investigation Workplan
Former Red Hanger Kleaners, 6239 College Ave., Oakland, CA
RO00002981

Dear Mr. Nowell:

This letter report serves as a *Supplemental Remedial Investigation (RI) Workplan* (workplan) for the above-property (site), prepared in response to requests by the County documented in correspondences dated April 18, 2017 and April 20, 2017. In the latter, the County requested a workplan specifically addressing the following:

1) Remediation system modifications, including a potential change of the site's soil vapor extraction (SVE) system into a dual-phase extraction (DPE) system;

2) Repair of the damaged clay pipe associated with the existing sanitary sewer lateral running adjacent to the site's soil vapor extraction wells, SVE-1, SVE-4, and SVE-5, given that the clay pipe may pose a threat to short-circuiting of the SVE system;

3) A comprehensive storm and sanitary utility line survey for the site; and

4) A subsurface investigation to further characterize the occurrence and flow of groundwater, the presence of tetrachlorethene (PCE) and related chemicals in groundwater, and additional soil gas sampling in support of assessing potential offsite source areas and leaking sewer lines.

It should be noted that proposed modification of the current onsite remediation system (Item 1 above) necessarily requires completion of the subsurface investigation required via Item 4 above, and will accordingly be proposed under separate cover once supplemental investigation data have been gathered and evaluated relative to the existing remediation system. Similarly, the potential need for repairing the damaged clay pipe section of the existing sanitary sewer lateral (Item 2 above) will be further evaluated once the modified remediation system has been put into operation. The need for such a repair will be communicated to the County under separate cover.

Storm and sanitary utility survey's, as requested by the County (i.e, Item 3 above) have previously been performed by others, and additional survey and utility condition assessment, as overseen by Fugro USA Land, Inc. (Fugro) in 2017 is ongoing. A summary of Fugro's findings to date are being compiled and will be reported on under separate cover to the County in the next few weeks. A copy of the results of a Topographic Survey undertaken in January 2017 to confirm property lines, the location of the clay portion of the sanitary lateral extending from 6239 College Avenue to 63rd Street, and building locations in the site area is included as Attachment 1 herein.

Previous Investigations

From 2005 to 2016, various phases of investigation for the site have been completed by numerous firms. Review of reports prepared by the former environmental consultant of record (P&D) do not appear to recount all site activities completed to date in a manner which facilitates adequate assessment of the data. Depiction of groundwater data for instance has been based on a compilation of grab groundwater data collected on different dates and from different depths, and as a result would not in our opinion provide a reasonable representation of the degree nor extent of chemical impact to groundwater. In addition, previous site plans used as base maps have perpetuated inaccuracies regarding property and building lines. This has resulted in points of investigation completed on adjacent parcels. What the data reported on to date does appear to suggest is that other sources/releases of dry cleaning chemicals have occurred beyond the limits of the 6235-6239 College Avenue property.

In March 2016, an interim remedial action plan comprising installation and operation of a Soil Vapor Extraction (SVE) system, was approved by the County to reduce PCE concentrations in soil vapor beneath the existing 6235-6239 College Avenue building and within the onsite parking areas. The SVE system has been in operation since June 2016. PCE vapors extracted by the SVE system have been treated onsite via activated carbon, with no PCE emissions to ambient air. LRM took over operation and maintenance of the SVE system in late 2016.

Scope of Proposed Work

Based on the above rationale, this workplan focuses on the supplemental subsurface investigation requested by the County (i.e., Item 4 above). The scope of this workplan includes:

- Installation and sampling of groundwater monitoring wells to help establish the occurrence and flow of groundwater onsite, to establish the nature and extent of volatile organic compound (VOC) groundwater impacts onsite, and to establish potential contribution of VOCs from suspected upgradient sources, including former Red Hangar and Kay cleaners located immediately adjacent and upgradient of the site. It should be noted that the definition of the extent (and addresses/parcels) covered by the site may be changed following completion of investigation activities outlined in this workplan;

- Installation of vapor monitoring wells and sampling of both newly installed and select existing soil vapor monitoring wells in support of evaluating the current extent of VOC impacts in soil vapor, and determination of potential contribution of VOCs in soil vapor from the aforementioned potential offsite sources.

The work above will be implemented in accordance to standard operating procedures (SOPs) for well installation and sampling included herein. All work to be performed per the SOPs will be preceded by obtainment of all necessary County/Public Work Agency permits, and in accordance to a site-specific health and safety plan.

Sampling Locations

Figure 1 depicts locations of proposed groundwater and vapor monitoring wells. In addition, Figure 1 highlights a subset of existing vapor wells proposed to be sampled at the same time as the newly proposed vapor wells, in order to provide a meaningful distribution of subsurface vapor quality

data collected at the same time. All proposed well locations were discussed with and preliminarily approved by the County during a meeting held on January 19, 2017, pending acceptance of access agreements with adjacent property owners.

Groundwater Monitoring Well Locations

Groundwater beneath the site has been subject to limited historical investigations using grab groundwater samples. Attachment 2 contains a figure prepared by P&D Environmental (2016)[1], depicting tetrachloroethylene (PCE) isoconcentration contours using grab groundwater data from variable dates and depths. As discussed previously, this depiction of the apparent distribution of PCE in groundwater is not defined using monitoring well data collected at the same time. Moreover, the occurrence and flow of groundwater is not well understood, with groundwater flow directions having been inferred from nearby data which is judged not representative. To this end, Figure 1 includes installation of six shallow groundwater monitoring wells; each to be characterized by a 10-foot screen from an estimated 15 to 25 feet below ground surface (bgs), assuming groundwater is encountered at 15 feet bgs. The screen interval will be set at 10 feet below first encountered groundwater during the drilling activities, as defined in the well installation SOPs included as Attachment 3 herein.

The rationale behind the proposed well locations is as follows:

- MW-1 and MW-2: These wells are proposed to assess groundwater quality migrating onto the site from upgradient locations, including potential offsite sources associated with the former Red Hanger and Kay Cleaners locations;
- MW-3: This well is proposed for the location in close proximity to the location of the highest PCE detection in existing shallow (7 feet below bgs) vapor monitoring wells at the site;
- MW-4: This well is proposed for monitoring the onsite downgradient portion of the PCE plume in groundwater along the northwestern corner of the site and in close proximity to existing soil vapor extraction well SVE-4, where elevated PCE detections in soil vapor have been detected at depth near the water table;
- MW-5: This well is located at the location of the highest detected vapor concentrations at depth (ie., 17 feet bgs), adjacent to existing soil vapor extraction well SVE-1, and further monitors the location where the highest grab groundwater concentration was historically collected at former boring location B10 (see Figure 1).
- MW-6: This well is proposed for the onsite downgradient portion of the PCE plume in groundwater along the southwestern corner of the site.

Installation of the wells at the proposed locations is pending reasonable access (especially for offsite wells MW-1 and MW-2) and utility clearance.

Each borehole will be logged by LRM's professional registered geologist. In addition, soil samples will be collected at 5-foot intervals down to the water table, estimated at 5, 10, and 15 feet bgs. In particular, soil samples from proposed monitoring wells MW-4 through MW-6 located along

[1] P&D Environmental, Inc., 2016. Site Investigation and Soil Vapor Extraction Report, Red Hanger Kleaners, 6239 College Ave., Oakland, CA, July 11th.

the western property boundary and near existing drains associated with sewer lines may yield useful information. A photoionization detector (PID) will be used to screen all soil being logged in all monitoring wells during drilling, and additional soil samples may be collected in response to elevated PID readings upwards of 50 ppm. SOPs for soil sample and handling collection are included in Attachment 3.

Following well installation/logging, surveying of well location and elevation, and well development (see SOPs in Attachment 1), the wells will be sampled for analysis using EPA Method 8260 B (reporting the 8010 list for chlorinated hydrocarbons) by McCampbell Analytical, a NELAP certified laboratory. Sampling handling and shipping procedures are included in Attachment 3.

Soil Vapor Monitoring Well Locations

Figure 1 depicts the distribution of PCE in existing shallow soil vapor monitoring wells at the site, reflecting samples collected in October 2015. This figure further depicts the location of newly proposed wells SG10 and SG11; each representing two vapor monitoring wells to be located immediately adjacent to one another. To match the existing wells at the site, each location will be characterized by a shallow (SG10-7 and SG11-7) and a deep (SG10-17 and SG11-17) vapor monitoring well extending to 7 and 17 feet bgs. SOPs for vapor monitoring well installation are included as Attachment 3, and include installation using a truck-mounted 6-inch outside diameter hollow stem auger.

Sampling of the proposed wells will be conducted at the same time as the additional existing wells marked on Figure 1, with sampling procedures outlined in Attachment 3. All investigation derived wastes will also be drummed, profiled, and disposed of in accordance to SOPs outlined in Attachment 3.

Reporting

Following completion of well installation and sampling activities, a supplemental RI report will be prepared, summarizing all procedures of the RI investigation, in addition to results of the sampling and associated conclusions and recommendations. The report will be submitted for County review, and finalized by addressing all County comments.

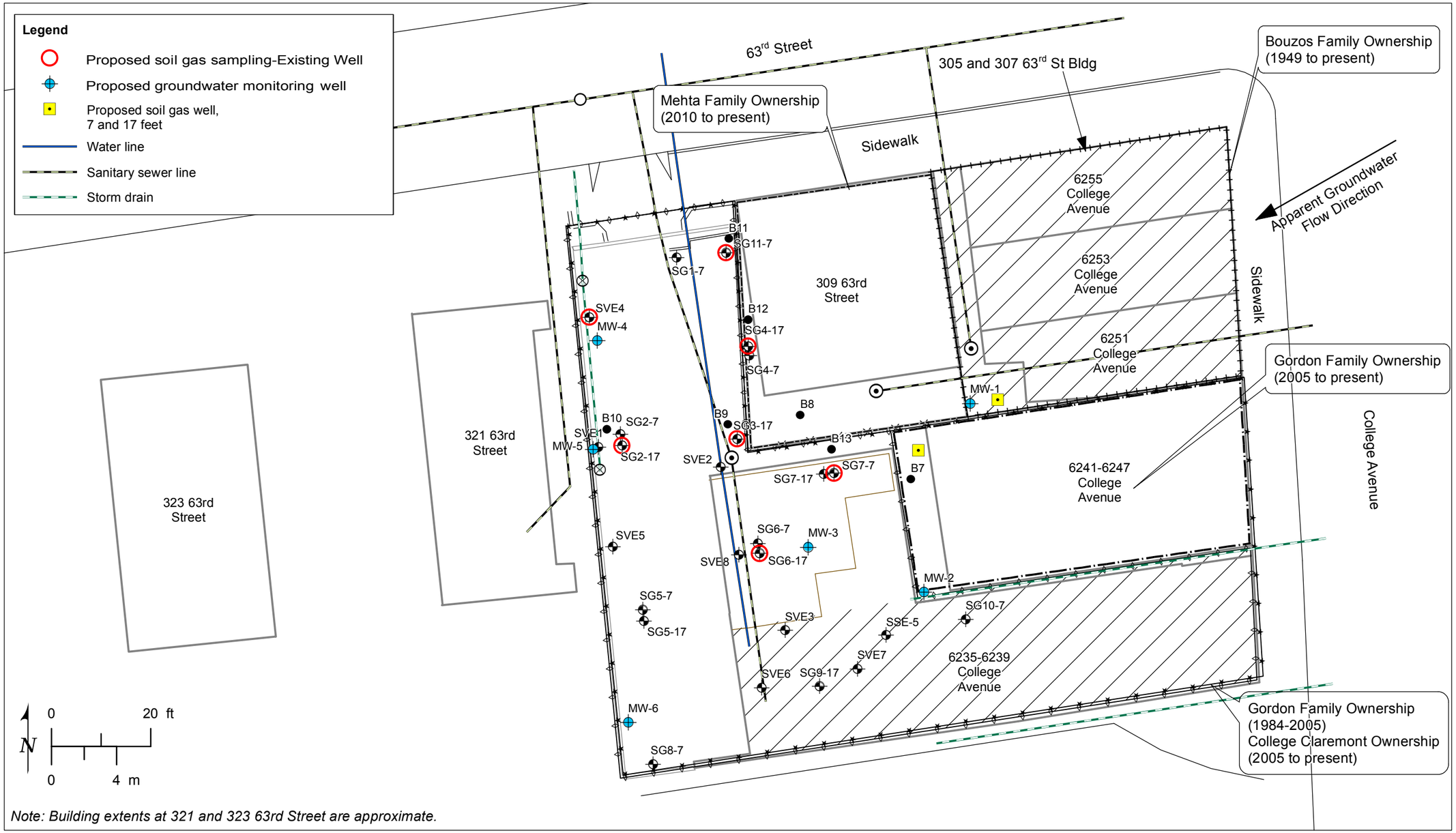
Closing

LRM appreciates the County's timely review of the document, and for its oversight and support of this project. If you have any questions, please contact Mehrdad Javaherian at 415-706-8935 or at mehrdad@lrm-consulting.com.

LRM Consulting, Inc.

Mehrdad Javaherian, Ph.D., MPH, PE, LEED®GA

FIGURE



Note: Building extents at 321 and 323 63rd Street are approximate.

Manhole
Drain inlet
Sanitary sewer cleanout
Soil vapor extraction point
Previous boring
Building outline
Fence
Garage

Property Ownership

Bouzos Family, 1949 to present
College Claremont, 2005 to present
Gordon Family, 1984-2005
Gordon Family, 2005 to present
Mehta Family, 2010 to present

Former dry cleaners use

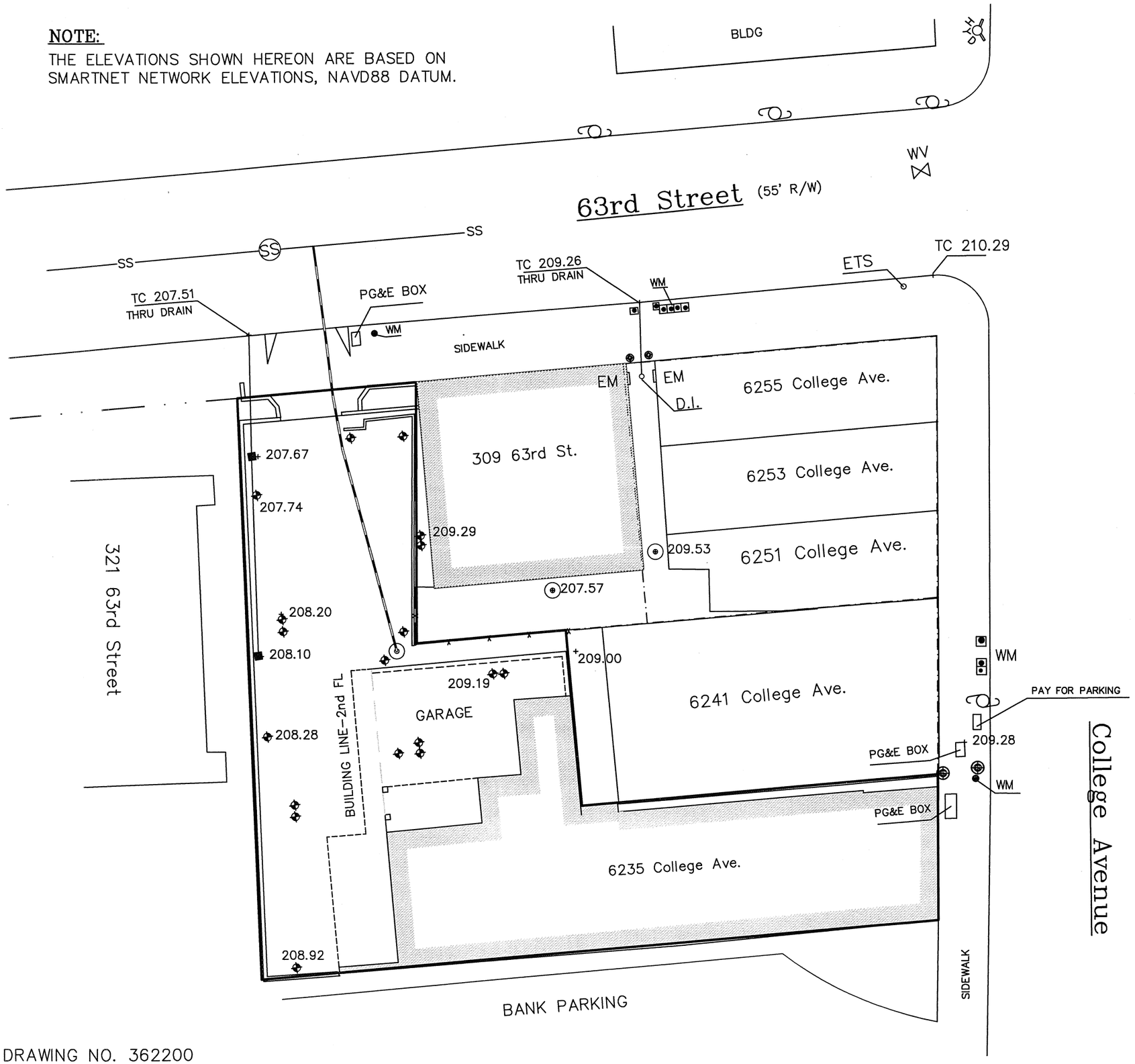
Basemap Source: Fuguro, 2017

LRM consulting inc.

Figure 1
Proposed Soil Vapor and Groundwater Monitoring Locations
Former Red Hanger Kleeners
Oakland, CA

ATTACHMENT 1

NOTE:
THE ELEVATIONS SHOWN HEREON ARE BASED ON SMARTNET NETWORK ELEVATIONS, NAVD88 DATUM.



DRAWING NO. 362200

SITE MAP

6235 COLLEGE AVE.
OAKLAND CA.

GRAPHIC SCALE

20 10 0 20

(IN FEET)
1 INCH = 20 FT.

LEGEND

- ⌀ – EXISTING UTILITY POLE
- ⊙ – SANITARY SEWER CLEANOUT
- (SS) – SANITARY SEWER MANHOLE
- □ – COLUMN
- GM – GAS METER
- EM – ELECTRIC METER
- ——— – PROPERTY LINE
- —·—·— – LOT LINE
- —X— – FENCE
- WV – WATER VALVE
- WM – WATER METER
- ◎ – GAS VALVE
- ◆ – MONITORING WELL

LICENSED LAND SURVEYOR
VIRGIL D CHAVEZ
No 6323
Exp
STATE OF CALIFORNIA

Virgil D. Chavez

VIRGIL CHAVEZ LAND SURVEYING
721 TUOLUMNE STREET
VALLEJO, CALIFORNIA
(707) 553-2476

FEB., 2017 SCALE: 1"=20'

ATTACHMENT 2

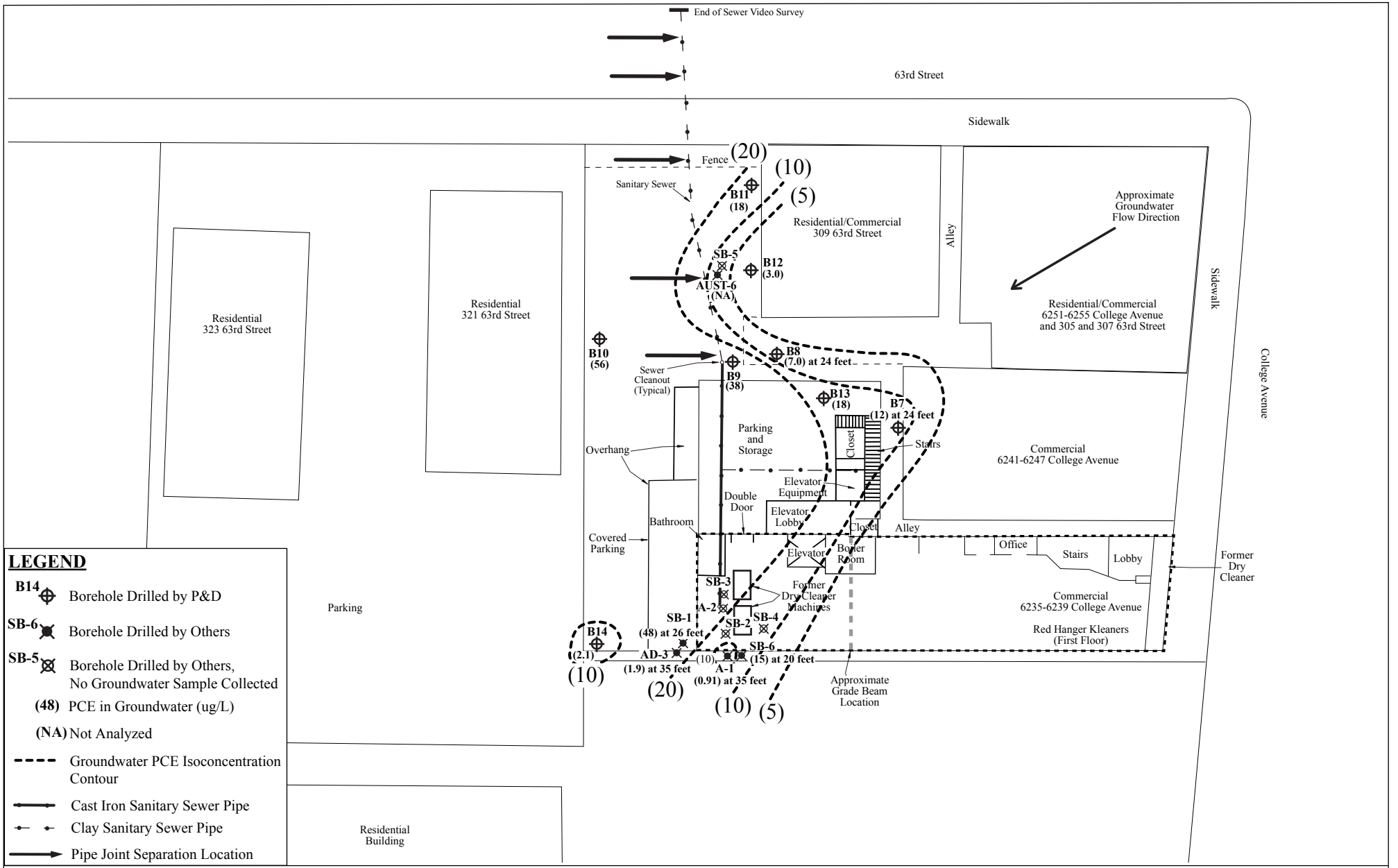


Figure 2
Site Plan Showing PCE Concentrations in Groundwater
Red Hanger Kleaners
6239 College Avenue
Oakland, California

Base Map from:
Gordon Building, July 30, 2007, Alameda County Assessor's Map, Revised June 15,1989, and Google Earth, 2015

P&D Environmental, Inc.
55 Santa Clara Ave., Suite 240
Oakland, CA 94610

0 15 30
Approximate Scale in Feet

N

ATTACHMENT 3

SOP-1 GROUNDWATER MONITORING WELL INSTALLATION

Drilling will be conducted using a hollow stem auger drill rig corresponding to a CME 75 2001 rig. Prior to well installation, a health and safety plan will be developed and reviewed via a tailgate meeting daily, and USA Dig Alert will be contacted and additional private utility clearance will be conducted on each proposed borehole location to ensure clearance of all utilities.

Drilling for Well Installation:

The borings will be drilled with a 4.25-inch inside diameter hollow stem auger equipped with a cutting head, center rod, and a center bit assembly that prevents the entry of any soil. The diameter of the well casing will be 2 inches. The boring will be advanced to a depth sufficient to target the long-term monitoring of the shallow, first-encountered groundwater, estimated to occur at 15 feet below ground surface (bgs).

Soil samples for lithologic logging will be collected continuously over a 10-foot interval toward the bottom of the borehole to confirm the presence of a groundwater-bearing zone and every five (5) feet for the remainder of each boring, unless otherwise directed through photoionization detector readings above 50 ppm as referenced further below.

As noted above, each boring will be advanced using a cutting head and center rod and assembly center bit. Once the sampling depth is reached, the center rod and the center bit will be retracted, and a spilt spoon assembly will be connected to the center rod. The split spoon will then be driven 24 inches in front of the lead auger with a 140-pound (lb) hammer. Once the sampling is completed, the split spoon assembly will be retracted, and the center bit will be reinserted and held in place by the center rod. Borings will be advanced further by connecting another auger section to the first, together with another center rod section and the boring is advanced.

Headspace Screening and Soil Sampling: Soil samples collected in the field above the water will be screened for the presence of VOCs with a Photoionization Detector (PID). Field screening will be performed as follows:

- Immediately upon opening the split spoon, the sample will be placed in a contaminate-free jar.
- The jar will be sealed with one continuous sheet of aluminum foil; the jar lid will be used to secure the foil.
- The sample jar will be vigorously agitated for fifteen seconds and then allowed a minimum of ten minutes for the sample to adequately volatilize. During cold weather, the samples will be warmed to near room temperature prior to taking the headspace measurement.
- The jar will be re-shaken and the jar lid will be removed. The PID will be quickly inserted through the aluminum foil, and the maximum meter response will be recorded.
- The measured headspace screening data will be recorded on the boring log.

- The PID will be calibrated in accordance with manufacturer's specifications twice daily and after a long shut down period (i.e. lunch breaks, equipment breakdowns, weather caused breaks, etc.).

- Unsaturated soil samples from 5, 10, and 15 feet bgs will also be collected from each well location and placed in an 8-oz glass jar for laboratory analysis of VOCs using EPA Method 8260 (8010 list for chlorinated solvents). Should PID readings in excess of 50 ppm be observed at a different vadose zone depth interval, additional vadose zone soil samples from those depths may also be collected for laboratory analysis.

Drill Logs: All drill logs will be prepared by a California-registered Professional Geologist, using the Unified Soil Classification System.

Well Installation

Well casings: Well casings will consist of Schedule 40 PVC pipe. PVC pipe will be new, threaded, flush joint, and will conform to the requirements of ASTM F 480 "Standard Specification for Thermoplastic Well Casing Pipe and Couplings Made in standard Dimension Ratios. It will bear markings that will identify the materials and will carry the seal of the National Sanitation Foundation. Threaded flush-joint couplings with chemically inert O-rings, to form watertight unions, will join riser sections.

Well Screen: Well screen will be two (2)-inch diameter schedule 40 PVC pipe. The screen material will be non-contaminating, non-clogging, continuous slot, wire wrap design. All screen sections will be threaded, flush joint design. The proposed slot size for the wells planned for installation will be 0.010 inches. The length of the well screen will be ten feet long. The wells will have flush-threaded bottom caps. The depth of the ten-foot long monitoring well screen interval that targets long-term monitoring of the shallow groundwater will be based on field observations by a licensed professional geologist. In general, the well screens will target the saturated interval that corresponds to 10 feet below the water table, estimated at 15 to 25 feet bgs.

Filter Pack: The annular space around the well screen will be backfilled with clean, washed, well-rounded silica sand sized to perform as a filter between the formation material and the well screen. Based on the available well construction information (twenty of twenty-two wells) installed during the RI, the filter pack will be 20/40 Colorado Silica Sand. The filter pack material will be tremied into place to avoid bridging and ensure a continuous filter pack throughout the screened interval of the well. The filter pack will extend approximately one (1) foot below, and three (3) foot above the well screen.

Bentonite Seal: A three (3) foot thick bentonite seal will be placed in the annular space above the well screen and filter pack sand. The bottom 2 feet of the seal to be placed above the sand will be composed of commercially manufactured, solvent-free, hydrated sodium-bentonite pellets. If the bentonite seal is placed above the water table, the bentonite will be installed in one (1)-foot lifts with each hydrated a minimum of thirty minutes between lifts before proceeding. Clean, potable water will be added to hydrate the bentonite. The top 1 foot of the bentonite seal will consist of a viscous 20% high solids bentonite slurry tremied into place.

The bentonite seal will be placed immediately after the installation of the filter pack.

Grout: Grout will be placed by pumping through a side discharging tremie pipe with the lower end of the tremie pipe located within three (3) feet of the top of the bentonite seal. Pumping will continue until undiluted grout flows from the boring at the ground surface. Grout placement will follow only after the bentonite seal is set. In the event that the bentonite seal is not fully hydrated/set on the same day, grout will be placed on the next day.

For this project, cement grout will be used. It will be placed above the bentonite seal to the ground surface. The cement grout will consist of a mixture of Portland cement (ASTM C 150) and water in the proportion of not more than seven (7) gallons of approved water per bag of cement (94 pounds). Additionally consistent with the Geology Supplement, three (3) percent by weight of sodium bentonite powder will be added.

Well Protection, Flush Mounted Construction: At all times during the progress of the work, precautions will be taken to prevent well tampering. Surface run-off will be prevented from entering the well during and after construction. Flush mounted well installations will be required in heavy traffic areas and at locations required by the landowner.

A locking water tight cap will be used on the well casings in flush mounted applications. A flush mounted, traffic-rated road box will be installed around the well casing. Road box installations will use a watertight road box to prevent surface water from entering the well. The well casing will extend approximately 3 inches above the sealant in the bottom of the well box.

Equipment Decontamination:

Drill Rig and Equipment Decontamination:

Decontamination water will be generated during high-pressure steam cleaning of the drill rig, drilling equipment, and tools. Steam cleaning of the drill rig, equipment, and tools will occur prior to drilling at each well location. Consistent with the practices implemented in the RI, high-pressure steam cleaning will take place at the point of generation (well location). The water from the high pressure steam cleaning will be allowed to fall on the ground. Note that the steam cleaning will not take place over the well and no water will be allowed to enter into the borehole.

Groundwater Sampling Equipment Decontamination:

- All reusable sampling equipment will be decontaminated prior to sampling and between samples by washing in a non-phosphate detergent (Alconox) solution.
- The final equipment rinse will be with distilled water, and will be concluded with an air drying step.
- Decontamination water will be placed in containers for temporarily onsite storage pending proper disposal and handled in accordance with SOP-8.

Soil Sampling Equipment Decontamination

- All reusable soil sampling equipment will be decontaminated prior to sampling and between samples by washing in a non-phosphate detergent (Alconox) solution.

- The final equipment rinse will be with distilled water, and will be conducted with an air drying step.
- Decontamination water will be handled in accordance with SOPs summarized herein.

SOP-2 GROUNDWATER MONITORING WELL DEVELOPMENT

Within one (1) week after each well has been constructed, but no sooner than forty-eight hours after grouting is completed, the installed groundwater monitoring wells will be developed.

The objectives of well development are to:

a. assure that ground water enters the well screen freely, thus yielding a representative ground-water sample and an accurate water level measurement;

b. remove all water that may have been introduced during drilling and well installation, and

c. remove very fine- grained sediment in the filter pack and nearby formation so that ground water samples are not highly turbid and so that silting of the well does not occur.

Development will consist of mechanical surging and bailing until little or no sediment enters the well. Well development shall continue for a minimum of two (2) hours. Sediment that enters the well during this process will be removed. At the end of that time, the well will be continuously pumped using an electric submersible or pneumatic- drive, positive displacement bladder pump. During pumping, temperature, pH, specific conductivity, and turbidity will be measured (one reading per well volume). Pumping will continue until these parameters have stabilized (less than 0.2 pH units or a ten percent change for the other parameters between four [4] consecutive readings) and the water is clear and free of fines.

Part of well development will include the washing of the entire well cap and interior of the well casing above the water table using only water from that well. The result of this operation will be a well casing free of extraneous materials (grout, bentonite, sand, etc.). This washing will be conducted during development, not after development is completed.

SOP-3 GROUNDWATER MONITORING WELL SAMPLING

The primary objective of low-stress purging and sampling is to collect consistently representative ground-water samples without altering water chemistry. Low-stress purging and sampling techniques help to reduce high turbidity levels that may adversely affect sample quality, which commonly occurs with conventional techniques that use bailers or high-speed pumps.

Prior to sampling, newly installed groundwater monitoring wells will be allowed to stabilize for a minimum of two (2) weeks prior to sampling. For all wells, LRM will determine (measure and record) depth to water and the total well depth using an electronic water level probe to determine the water volume to be purged. The well volume will be calculated using the as built depth and the actual well depth will be measured upon completion of sampling activities. Note that groundwater monitoring well sampling will proceed from the least contaminated to the most contaminated wells (using professional judgment on wells that have not been sampled previously) to minimize potential cross contamination.

Well Purging: Wells will be purged with a bladder pump. Teflon® tubing will be used for sampling.

If the recharge rate of the well is lower than extraction rate capabilities of currently manufactured pumps and the well is essentially dewatered during purging, then the well will be sampled as soon as the water level has recovered sufficiently to collect the appropriate volume needed for all anticipated samples (ideally the intake will not be moved during this recovery period). Samples can then be collected even though the indicator field parameters have not stabilized.

Water quality indicator parameters will be measured every three (3) to five (5) minutes by instruments contained in an in-line flow-through cell attached to the pump. Purging will be considered complete when parameters stabilize for at least three (3) consecutive readings within the following limits: 1ºC for temperature, ± 0.1 for pH, ± 0.01 milli Siemens per centimeter (mS/cm) or ± 3% (whichever is less) for conductivity, ± 10 millivolts (mV) or 10% (whichever is less) for redox potential, ± 10% for turbidity, and ± 0.3 mg/L or ± 10% (whichever is less) for dissolved oxygen. Ideally, an attempt will be made to purge until turbidity drops below 10 NTU, but this will not be a requirement. Removal of a specific volume of water is also not required, provided all water quality parameters are stable as noted above.

Wells will not be dewatered or purged dry, which can cause aeration as ground water cascades back into the well. Water table wells with slow recharge that results in significant drawdown (greater than 0.33 feet) while purging at the lowest possible rate will be pumped at a rate between 100 mL/min to 200 mL/min (0.03 to 0.05 gallons per minute [gpm]) for a minimum of 1 hour, unless drawdown exceeds 2 foot. If a drawdown of >2 foot occurs in a water table well, purging will be stopped to allow the well to recover before sampling.

Sample Collection: Pertinent sampling measurements- intake depth and drawdown information from sampling event(s) for each well, etc. will be recorded.

After water quality indicator parameters stabilize, ground-water samples will be collected immediately and after in-line monitoring equipment have been removed prior to sample collection. During sample collection, the pumping rate will remain the same or lower than the purging rate to minimize aeration, bubble

formation, or turbulent filling of sample bottles. New drawdown, flow rate and new indicator field parameter values.

During purging and sampling, the tubing will remain filled with water so as to minimize possible changes in water chemistry upon contact with the atmosphere. A 1/4 inch or 3/8 inch (inside diameter) tubing will be used to help insure that the sample tubing remains water filled. If the pump tubing is not completely filled to the sampling point, one of the following procedures will be used to collect samples: (1) add clamp, connector (Teflon or stainless steel) or valve to constrict sampling end of tubing; (2) insert small diameter Teflon tubing into water filled portion of pump tubing allowing the end to protrude beyond the end of the pump tubing, collect sample from small diameter tubing; (3) increase flow rate slightly until the water completely fills the tubing, collect sample and record new drawdown, flow rate and new indicator field parameter values.

In general, sample collection sequence for various analytes will begin with VOCs. Samples will be drawn and placed in the appropriate sample bottles immediately upon receipt of water at the surface. The samples will then be immediately placed in a cooler and maintained at a temperature of 4 degrees Centigrade until received at the laboratory.

SOP-4: SOIL VAPOR MONIITORING WELL/SUB-SLAB VAPOR PIN INSTALLATION AND SAMPLING PROCEDURES

SOIL VAPOR MONITORING WELL INSTALLATION PROCEDURES

The shallow and deep soil vapor probes will be completed using a Geoprobe drill rig to a depth of approximately 7 and 17 feet below grade, respectively, within a 4.25-inch diameter hole. One-quarter inch teflon tubing with an implant vapor sampling tip will be placed in the hole to approximately three inches above the total depth. The lowermost six inches of annular space will be filled with #2/16 sand. Approximately one foot of granular bentonite will be placed over the sand pack. Neat cement grout will be placed over the bentonite to the surface. A five-inch well box will be placed over the sampling point at the surface.

SOIL VAPOR MONITORING WELL SAMPLING PROCEDURES

To allow subsurface conditions to equilibrate, soil vapor and sub-slab sampling will be conducted at least 48 hours after probe installation at each soil vapor and sub-slab sample location. In accordance with the Department of Toxic Substances Control advisory (DTSC, 2012), purging and sampling rates will be limited to 100 to 200 milliliters (mls) per minute and a maximum vacuum of 100 inches of water column to limit stripping and prevent ambient air from diluting the samples.

Shut-in Test: Prior to soil-vapor/sub-slab purging or sampling, a shut-in test will be conducted to check for leaks in the sample train. The shut-in test will consist of assembling the above-ground apparatus (valves, lines, and fittings downstream of the top of the probe), and evacuating the lines to a measured vacuum of about 100 inches of water, then shutting the vacuum in with closed valves on opposite ends of the sample train. The vacuum gauge will then be observed for at least 1 minute, and if there is any observable loss of vacuum, the fittings will be adjusted as needed until the vacuum in the above-ground portion of the sample train does not noticeably dissipate. The vacuum gauge will be calibrated and sensitive enough to indicate a water pressure change of 0.5 inches.

Leak Testing: Helium tracer testing will be conducted to confirm absence of ambient air intrusion into the sample train at each soil vapor and sub-slab sampling location. A clear plastic container (shroud) will be inverted over the probe and the sample train and filled with about 10% to 30% helium by volume. Soil vapor/ sub-slab samples will be collected in a Tedlar bag and will be screened using a portable helium meter (MDG2002 or equivalent) to confirm absence of helium in the collected samples. Leak testing will be conducted during the purge volume testing noted below and also during the collection of the soil vapor/sub-slab samples to be collected following the purge testing. In addition, helium will be analyzed for in the vapor samples submitted to the laboratory.

A brief outline of a purge volume test to be conducted prior to soil vapor sampling (targeting determination of the purge volume to be used at each sample location) is presented below.

Purge Volume Test: To ensure stagnant or ambient air is removed from the sampling system and to assure samples collected are representative of subsurface conditions, a purge volume versus contaminant concentration test will be conducted as the first soil gas sampling activity at the selected purge test point. The purge volume test is conducted by collecting and analyzing a sample for target compounds after the removal of appropriate purge volumes.

Purge Volume: The purge volume or "dead space volume" can be estimated is based on the internal volume of tubing used, and annular space around the probe tip. Step purge tests of one (1), three (3), and seven (7) purge volumes will be conducted as a means to determine the purge volume to be applied at all sampling points. The testing will be conducted using a Tedlar bag in the field and the collected sample will be measured for total VOCs using a photo ionization detector (PID).

The appropriate purge volume will be selected based on the highest concentration for the VOCs detected during the step purge tests. If VOCs are not detected in any of the step purge tests, a default of three (3) purge volumes will be extracted prior to sampling at each soil vapor sample location.

Soil vapor and sub-slab samples will be collected following purging of the probe at the selected purge volume using a 1 liter summa canister. As noted above, sampling rates will be limited to 100 to 200 mL/minute flow rate and 100 inches of water column vacuum.

Field conditions, such as wet soil conditions, fine grained sediments, or barometric pressure changes may affect the ability and/or the quality of the collected soil vapor samples.

Wet Conditions: If no-flow or low-flow conditions are caused by wet soils, the soil vapor or sub-slab sampling will cease and commenced after the soils have sufficiently dried to allow sampling at the flow rates and vacuum noted above. In addition, no soil vapor sampling will be conducted within five days of a significant rain event (i.e., 0.5 inch or greater) or onsite watering event.

Low Permeable Soils Sampling: Under conditions where low permeable soils surround the soil vapor or sub-slab sampling probe thereby limiting the flow rate of soil vapor that can be drawn from the surrounding soils into the soil vapor probe, soil vapor will be withdrawn from the probe until such time that steady flow cannot be obtained by applying a vacuum of up to 100 inches water column, The sampling will then be discontinued to allow the vacuum to dissipate as soil vapor slowly enters the sandpack and probe tubing from the surrounding soils. Sampling will then continue until an adequate volume of sample has been collected in the 1 liter canister.

Barometric Pressure Changes: To the extent practicable, soil vapor and sub-slab sampling will be conducted when the changes in barometric pressure are not significant during the course of the sampling. To this end, records of barometric pressures will be obtained from local sources during the duration of the soil vapor sampling. If changes in barometric pressure are such that its effect on data quality is measurable, such observations will be summarized in the technical report outlining the sampling activities.

A sample field form to be used to record data collected in the field is enclosed at the end of this attachment.

SUB-SLAB VAPOR PIN INSTALLATION AND SAMPLING

Vapor pins will be installed with a flush-mounted secure cover. A rotohoammer will be used to drill a 1.5-inch diameter hole to a depth of 1.75 inches into the concrete slab. A 5/8-inch diameter hole was then drilled through the center of the 1.5-inch diameter hole in the slab to a depth of two inches beneath the bottom of the concrete slab. The total concrete floor slab thickness at the site has been measured at approximately 6 inches. Once drilling is completed, a steel rod will be inserted into the hole and pushed into the sub-slab materials to a depth of approximately 6 inches below the slab several times to puncture any vapor barrier that may be present (as reported beneath the onsite building). The hole will then be cleaned with a vacuum and a bottle brush. A new Vapor Pin with a new silicone sleeve will then be installed in the 5/8-inch diameter hole in the concrete slab and covered with a flush-mounted stainless steel cover. Prior to placement of the flush-mounted stainless steel cover, a plastic cap will be placed on top of the vapor pin barb fitting.

Sub Slab Vapor Sample Collection:

Shut-in Test: Prior to sub-slab purging or sampling, a shut-in test will be conducted to check for leaks in the sample train. The shut-in test will consist of assembling the above-ground apparatus (valves, lines, and fittings downstream of the top of the probe), and evacuating the lines to a measured vacuum of about 100 inches of water, then shutting the vacuum in with closed valves on opposite ends of the sample train. The vacuum gauge will then be observed for at least one (1) min, and if there is any observable loss of vacuum, the fittings will be adjusted as needed until the vacuum in the above-ground portion of the sample train does not noticeably dissipate.

Leak Testing: Helium tracer testing will be conducted to confirm absence of ambient air intrusion into the sample train at each sub-slab sampling location. A clear plastic container (shroud) will be inverted over the probe and the sample train and filled with about 10% to 30% helium by volume. Sub-slab samples will be collected in a Tedlar bag and will be screened using a portable helium meter (MDG2002 or equivalent) to confirm absence of helium in the collected samples.

Sample Collection: Sample collection will be conducted as follows:

- The tubing will be purged using a vacuum pump. The volume of air (volume = $\pi r^2 h$) in the tubing will be calculated and three (3) tubing volumes will be purged prior to sample collection at a rate no greater than 0.2 liter per minute (lpm).

- An evacuated 6-L Summa® passivated (or equivalent) canister will be used to collect the sub-slab vapor sample. The canister will be provided by the laboratory, along with a flow controller equipped with an in-line particulate filter and a vacuum gauge. The flow controller will be pre-calibrated by the laboratory for the desired flow rate for the duration of thirty minutes for sample collection. The sampling flow rate will always be less than 0.2 lpm.

- The protective brass plug will be removed from the canister. The pre-calibrated flow controller will be connected to the canister.

- The identification numbers for the canister and flow controller will be recorded. The initial canister pressure on the vacuum gauge will be recorded. A canister with a significantly different pressure than originally recorded by the testing laboratory will not be used for sampling. The initial canister pressure will be recorded on the chain-of-custody form for each sample.

- The tubing from the sub-slab vapor sampling probe will be connected to the flow controller.

- The valve on the canister will be completely opened. The time that the valve is opened (beginning of sampling) and the canister pressure on the vacuum gauge will be recorded.

- The sample collection will be stopped after the scheduled duration of sample collected, but when the canister still has a minimum amount of vacuum remaining in it (approximately 4 inches of mercury).

- The final vacuum pressure will be recorded and the canister valve will be closed. The date and time that sample collection was stopped will be recorded.

- The flow controller from the canister will be removed and the protective brass plug will be replaced.

- The labels/tags (sample name, time/date of sampling, etc.) will be attached to the canister.

- The canister and other laboratory-supplied equipment will be placed in the packaging provided by the laboratory.

- The information required for each sample will be entered on the chain-of-custody form, making sure to include the identification numbers for the canister and flow controller, and the initial and final canister pressures on the vacuum gauge.

- Upon completion of sampling, the probes will be removed, and the slab hole will be sealed with cement.

Field conditions, such as wet soil conditions or barometric pressure changes may affect the ability and/or the quality of the collected sub-slab vapor samples.

Wet Conditions: If no-flow or low-flow conditions are caused by wet soils, the sub-slab sampling will cease and commenced after the soils have sufficiently dried to allow sampling at the flow rates noted above. In addition, no sub-slab vapor sampling will be conducted during or immediately after a significant rain event (e.g., 1/2 inch or greater in a 24-hour period) or onsite watering event. Sub-slab vapor sampling will only occur after five days without a significant rain event.

Barometric Pressure Changes: To the extent practicable, sub-slab vapor a sampling will be conducted when the changes in barometric pressure are not significant during the course of the sampling. To this end, records of barometric pressures will be obtained from local sources during the duration of the sub-slab vapor sampling.

SOP-5 SAMPLE HANDLING, CUSTODY, AND DISPOSAL

The field technical lead will be responsible for completing the sample bottle label and chain-of-custody form, sample collection, sample packing, and coordination of sample shipment. The samples will be sent to the appropriate laboratory via courier. The sample packing and shipping procedures are provided below.

Sample Identification:

Each sample collected will be given a unique sample ID number that is project- and location-specific. A record of sample ID numbers will be kept with the field records and recorded on chain-of-custody forms.

Sample Labels:

For groundwater and water supply well samples, sample labels will be affixed to sample containers.

The label will be completed with the following information written in indelible ink:

- Project name and location
- Sample ID number
- Date and time of sample collection
- Preservative used
- Sample collector's initials
- Analysis required

For sub-slab vapor, and indoor air/ambient air (to be collected if required), the above information will be written on the sample tag that is affixed to the summa canister that is used to collect the sample. In addition to the information noted above, the initial and final vacuum pressures on the canisters will also be recorded on the tag.

After labeling, groundwater and water supply well samples will be placed in a cooler that contains ice to maintain the sample temperature at 4 ± 2 ºC. A temperature blank will be provided in each cooler for the laboratory to confirm storage temperature upon sample receipt.

Summa canisters used to collect sub-slab vapor and indoor air/ambient air (if required) samples will be packed in boxes provided by the laboratory.

Chain of Custody Form: Standard sample custody procedures will be used to maintain and document sample integrity during sample collection, transportation, storage, and analysis. A sample will be considered to be in custody if one of the statements below applies.

- It is in a person's physical possession or view.
- It is in a secure area with restricted access.

- It is placed in a container and secured with an official seal such that the sample cannot be reached without breaking the seal.

Chain-of-custody procedures provide an accurate written record that traces the possession of individual samples from the time of collection in the field to the time of acceptance at the laboratory. The chain-of-custody record also will be used to document samples collected and the analyses requested. The field personnel will record the following information on the chain-of-custody record:

- Project name and number
- Sampling location
- Name and signature of sampler
- Destination of samples (laboratory name)
- Sample ID number
- Date and time of collection
- Number and type of containers filled
- Analysis requested
- Preservatives used (if applicable)
- Sample designation (grab or composite)
- Signatures of individuals involved in custody transfer, including the date and time of transfer

Sample Packaging and Shipping: After labeling, groundwater and water supply well samples will be placed in a cooler that contains ice to maintain the sample temperature at 4 ± 2 ºC. A temperature blank will be provided in each cooler for the laboratory to confirm storage temperature upon sample receipt. Openings will be taped shut to prevent potential leakage during transport.

Summa canisters used to collect sub-slab vapor and indoor air/ambient air (if required) samples will be packed in boxes provided by the laboratory.

SOP-6 INVESTIGATION DERIVED WASTE MANAGEMENT

Soil IDW: Soil cuttings generated from borings drilled for installation of monitoring wells at and near the primary source areas will be containerized in DOT-certified 55-gallon drums. Soil samples will be collected from these drums and tested for VOCs by EPA 8260B, with the profile results sent to Belshire Environmental for formal profiling and removal from the site under a waste manifest.

Groundwater/Decontamination Water IDW*:* Water samples will be collected from IDW water for profiling, and the collected samples will be tested for VOCs by EPA 8260. Drummed liquid IDW will be similarly disposed of by Belshire Environmental under a signed waste manifest.