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Solano Group
P.O. Box 9026
Berkeley, CA 94709

July 29, 2013

Mr. Mark Detterman
Alameda County Health Care Services Agency
Department of Environmental Health
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502-6577

Re: Albany 1-Hour Cleaners
1187 Solano Avenue
Albany, California
ACEH Case No. 2857

Dear Mr. Detterman:

The Solano Group has retained Pangea Environmental Services, Inc. (Pangea) for environmental consulting services for the project referenced above. On my behalf, Pangea is submitting the attached *Interim Remediation Workplan.*

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

Sincerely,

J. Anthony Kershaw
General Partner
Solano Group

PANGEA

July 29, 2013

VIA ALAMEDA COUNTY FTP SITE

Mr. Mark Detterman
Alameda County Environmental Health
1131 Harbor Bay Parkway, 2nd Floor
Alameda, California 94502

Re: **Interim Remediation Workplan**
Former Albany 1-Hour Cleaners
1187 Solano Avenue
Albany, California 94706
ACEH SLIC Case #RO0002857

Dear Mr. Detterman:

On behalf of the Solano Group, Pangea Environmental Services, Inc. (Pangea) has prepared this *Interim Remediation Workplan* (Workplan). This Workplan was requested at our meeting on July 22, 2013 during our discussion of results from the approved *Assessment Workplan* dated June 17, 2013. The subject Workplan proposes excavation of shallow soil impact identifed during the recent site assessment. The primary objective of this interim remediation is to excavate residual source area soil impacted by PCE to further reduce the potential for vapor intrusion into indoor air. The Workplan also proposes installation of additional ventilation piping and additional assessment of subslab conditions.

If you have any questions or comments, please call me at (510) 435-8664.

Sincerely,
Pangea Environmental Services, Inc.

Bob Clark-Riddell, P.E.
Principal Engineer

Attachment: *Interim Remediation Workplan*

cc: Mr. J. Anthony Kershaw, Solano Group, P.O. Box 9026, Berkeley, CA 94709
Dr. Ramtin Nassiri, 1183 Solano Avenue, Albany, CA 94706
Anne J. Wolfe, USPS Facilities R&A Team West (1191 Solano Avenue tenant)
Albany Medical Group, 1181 Solano Ave, CA 94706
John Guhl, 1175 Solano Avenue, Albany, CA
SWRCB Geotracker Database (electronic copy)

INTERIM REMEDIATION WORKPLAN

Former Albany 1-Hour Cleaners
1187 Solano Avenue
Albany, CA 94706
ACEH SLIC Case RO0002857

July 29, 2013

Prepared for:

J. Anthony Kershaw
Solano Group
P.O. Box 9026
Berkeley, California 94709

Prepared by:

Pangea Environmental Services, Inc.
1710 Franklin Street, Suite 200
Oakland, California 94612

Written by:

REGISTERED PROFESSIONAL ENGINEER
ROBERT G. CLARK-RIDDELL
No. C 049629
Exp. SEPT 2014
CIVIL
STATE OF CALIFORNIA

Tina de la Fuente
Project Scientist

Bob Clark-Riddell, P.E.
Principal Engineer

INTRODUCTION

On behalf of the Solano Group, Pangea Environmental Services, Inc. (Pangea) has prepared this *Interim Remediation Workplan* (Workplan). This Workplan was requested at our meeting on July 22, 2013 during our discussion of results from the approved *Assessment Workplan* dated June 17, 2013. The subject Workplan proposes excavation of shallow soil impact identifed during the recent site assessment. The primary objective of this interim remediation is to excavate residual source area soil impacted by PCE to further reduce the potential for vapor intrusion into indoor air. The Workplan also proposes installation of additional ventilation piping and additional assessment of subslab conditions.

SITE BACKGROUND

Site Description

The subject site consists of a vacant, one-story commercial unit at 1187 Solano Avenue (Figures 1, 2 and 3). Dry cleaner operations occurred at Albany 1-Hour Cleaners at 1187 Solano Avenue (subject site) from approximately 1986 to 2011. In 2004, hydrocarbon-based cleaning equipment was installed to replace the equipment that used tetrachloroethene, also known as perchloroethene (PCE).

The subject site represents one unit of an entire commercial block of single-story units/buildings along Solano Avenue, for which the responsible party (Solano Group) owns the north side of the block. Parcel number 66.2801-22-1 includes 1175 Solano (pizza restaurant), 1181 Solano (medical offices), 1183 Solano (dentist office), and 1185 Solano (vacant and immediately adjacent subject site). Parcel number 66.2801-20 includes 1191 Solano (U.S. Post Office). Residential properties are north and northwest of the subject site. Cornell Elementary School is present about 150 ft southeast (upgradient) of the subject site.

Site Corrective Action

Subsurface assessment was performed in 2004 and 2005 by Avalon Environmental Consultants of Tustin, California, to evaluate potential cleaning solvent impact to soil, soil gas, and groundwater. The assessment included soil gas sampling from 5 ft depth in four (4) temporary probes (SG- 1 through SG-4), soil sampling from three (3) shallow borings at 5 ft depth (GP-1 through GP-3), soil sampling from five (5) deeper borings to 10 to 30 ft depth (GPA-1 through GPA-5), and groundwater sampling from approximately 30 ft deep within the five deeper borings completed to a maximum of 37 ft bgs. Prior site assessment was summarized and evaluated in the *Soil Gas Investigation and Human Health Risk Assessment* dated June 8, 2006. Avalon reported that no sensitive receptors such as schools, day care centers or hospitals are located within 100 ft of the subject property structure, and that the nearest residences are located greater than 100 ft north and separated by a parking lot. Avalon's report concluded that the risk posed by the identified compounds was within acceptable levels for commercial site use and recommended no further action at the time. In a letter dated July 5, 2006, the Alameda County Environmental Health (ACEH) concurred with the report findings and requested a closure request for commercial land use with a draft deed restriction limiting future land use. The ACEH required additional action to allow case closure with *unrestricted* land use and avoid a deed restriction.

In January 2013, the Solano Group retained Pangea Environmental Services of Oakland, California, to review site environmental conditions prior to site improvements for a planned restaurant. Due to elevated PCE impact in subslab gas, significant additional assessment and interim remediation was performed. Between January and June 2013, Pangea performed extensive site assessment, remediation, and vapor intrusion mitigation efforts. The additional assessment included soil sampling from forty five (45) borings; groundwater sampling within three groundwater monitoring wells, eleven (11) borings and three (3) excavation locations; and subslab soil gas sampling from ten (10) probes. The PCE concentrations at select locations in soil, subslab gas, and shallow groundwater impact exceeded applicable environmental screening levels. In February and March 2013, all identified soil impact that exceeded residential Environmental Screening Levels (ESLs) established by the San Francisco Bay Region - Regional Water Quality Control Board was removed and disposed offsite. Approximately 361.8 tons of soil was removed and disposed offsite. The excavation cavity was primarily backfilled with controlled density fill (CDF) to support the building wall during excavation under the wall, and to help mitigate vapor intrusion from any residual PCE impact.

Commencing in May 2013, the Solano Group and Pangea began meeting regularly with ACEH staff to coordinate investigation and/or corrective action activities for this site. An *Assessment Workplan* was submitted to ACEH on June 17, 2013 and conditionally approved by ACEH on June 28, 2013. A *Public Fact Sheet Notice* was mailed out on July 3, 2013 to property owners and tenants within a 200 ft radius of the subject site boundary.

In July 2013, Pangea performed soil and subslab gas sampling consistent with the *Assessment Workplan* to further delineate the extent of PCE in shallow soil and subslab gas. The assessment scope included the completion of nine (9) soil borings (5 angled borings and 4 vertical borings), subslab gas sampling from seventeen (18) probes, and subsurface gas sampling from two (2) ventilation wells in shallow soil. Vacuum influence measurements were also obtained from new subslab probes in 1183 and 1191 Solano to evaluate the effectiveness of subslab venting using the existing subslab vent piping layout.

Based on results of this assessment, interim remediation is recommended to excavate residual source area soil impacted by PCE for further reducing the potential for vapor intrusion into indoor air. Based on vacuum inflence data, additional ventilation piping installation is also recommended. Indoor air testing and supplemental subslab gas testing are also recommended to address data gaps and evaluate vapor intrusion potential. Additional site assessment and initial indoor air testing will be proposed soon in a separate workplan.

Upon completion of the interim remediation, additional subslab testing, and indoor air testing, ACEH requests preparation of a *Soil and Water Investigation/Conceptual Site Model (SWI/CSM)* report to comprehensively document site conditions and prior site activity. The ACEH also requests a *Feasibility Study/Corrective Action Plan* to accompany the SWI/CSM and to present the recommended corrective action approach for residual PCE impact.

Historic sampling data for soil, groundwater, and soil gas are summarized on Tables 1, 2 and 3, respectively. Current site impact by PCE for subslab gas and groundwater is summarized on Figures 2 and 3, respectively. PCE impact to soil is summarized on Figures 4 and 5. Figure 4 shows PCE in soil following excavation and boring data through May 24, 2013, while Figure 5 shows PCE in soil based on analytical results from soil sampling performed in early July 2013. The proposed excavation area to target residual PCE impact is shown on Figure 6. Planned expansion of the existing subslab depressurization system is also illustrated on Figure 6.

PROPOSED INTERIM REMEDIATION

Interim remediation is proposed to excavate residual source area soil impacted by PCE in an effort to further reduce the potential for vapor intrusion into indoor air. While prior excavation removed extensive PCE impact to site soil beneath commercial units at 1187 and 1191 Solano Avenue, this Workplan proposes excavation to target PCE impact to soil (and soil gas) beneath 1185 Solano based on additional site characterized from early July 2013. The workplan also proposes the installation of additional vent piping to help minimize the potential for vapor intrusion at adjacent units at 1183 Solano and 1191 Solano. Before describing our proposed excavation and additional vent installation, Pangea discusses below the July 2013 assessment results and our initial conceptual site model for subsurface conditions.

Summary of July 2013 Assessment Results

The July 2013 assessment results indicated that very little PCE impact was detected in site *soil* beneath 1185 Solano. As shown on Figure 5, the most significant detection was 0.7 milligrams/kilogram (mg/kg) PCE at boring B-33 at 1 ft below grade surface (bgs). The next highest detected PCE concentration was 0.084 mg/kg at boring B-32, also at 1 ft bgs. Lower PCE concentrations were detected at B-34 at 1 ft bgs and in the shallowest samples from angled borings A-8, A-9, and A-10. Other than 0.009 mg/kg and 0.0079 mg/kg at about 2 ft bgs in angled borings A-8 and A-10, respectively, no PCE was detected in soil deeper than 2 ft at 1185 Solano. The July 2013 assessment did, however, find elevated PCE in *subslab gas* beneath 1185 Solano, helping identify shallow PCE impact in soil that could be targeted by excavation. Figure 2 illustrates the extent of PCE in subslab gas based on recent sampling in July 2013 beneath all units within the contiguous buildings (1183, 1185, 1187 and 1191 Solano).

Initial Conceptual Site Model

The July 2013 characterization provided additional data to refine our conceptual site model of subsurface conditions. Based on current data, historic data, and prior site documentation, Pangea offers the following summary of subsurface conditions.

Potential Source of PCE: Albany 1-Hour Cleaners operated at 1187 Solano Avenue from approximately 1986 to 2011, but PCE use apparently discontinued in 2004 when hydrocarbon-based cleaning equipment was installed. Therefore, PCE releases could have commenced in 1986 and would have discontinued in 2004. Over this 18 year period PCE may have entered the subsurface via three primary methods: (1) penetrating the concrete floor near the former dry cleaner location where most impact has been detected [near boring B-7], (2) breaching the concrete floor or the southern sanitary sewer piping near the former washing equipment [near boring B-3], or (3) migrating along preferential pathways/conduits in vapor phase and/or in aqueous phase aided by reported extensive water flooding at 1187 Solano. Potential preferential pathways include the sanitary sewer backfill material or the subslab baserock. The lack of significant PCE impact detected along the sanitary sewer suggests that PCE did not leak significantly from the sanitary sewer. A video survey of the northern sanitary sewer out to the Solano Avenue main suggests that the cast iron piping is in good condition.

Former Dry Cleaning Equipment Area: As shown on Figure 4, the highest PCE impact in soil was detected immediately beneath and adjacent the former PCE-using equipment. Pangea suspects PCE penetrated the concrete floor or somehow entered the subsurface at this location sometime during the 18-year period of 1986 to 2004, in either one or more discrete events or somewhat continuously (e.g., periodic surface spills). Once under the concrete floor, PCE migrated downward through clayey site soil to the apparent groundwater interface/capillary fringe at approximately 9 ft depth bgs. PCE migrated laterally within the low-permeability saturated zone approximately 100 ft (Figure 4) at depths between approximately 9 to 15 ft bgs. No PCE impact has been detected in soil deeper than 15 ft bgs, or in the first real water-bearing materials (silty gravel) approximately 6 to 12 inches thick encountered approximately 30 ft bgs. Site excavation activity in February and March 2013 removed all identified soil impact that exceeded residential screening levels (RWQCB ESLs). Approximately 361.8 tons of soil was removed and disposed offsite, and the primary backfill of cement slurry provided support and helps mitigate vapor intrusion from any residual PCE impact.

Former Washing Equipment/Sewer Termination: PCE may have also entered the subsurface near a former washer location along the western portion of 1187 Solano, which is also where sanitary sewer piping exists the 1187 Solano unit at two locations. The northern sewer exits to Solano Avenue and appears in good condition, except for the first few feet near the 1185 Solano bathroom where some corrosion/wear was observed. A significant PCE release is not suspected along the sewer line beneath the 1185 Solano unit since limited PCE impact has been detected in soil near the sewer piping. During excavation along the western side of 1187 Solano, the southern sewer piping terminated after a few feet. The southern sewer piping may have been connected to a sink or wash area along the western wall of 1187 Solano; this sewer piping may have joined the main sewer within 1187 Solano before exiting via the northern sewer. The terminating southern sewer is shown on Figure 5. The highest PCE impact detected in soil along the western side of 1187 Solano was at boring B-3, near this potential release location. As shown on Figure 2, the highest PCE in subslab soil gas detected in July 2013 was near this location within the adjacent 1185 Solano unit. During the February/March 2013 excavation, PID readings suggested elevated impact in deeper soil at this location, so the excavation was extended to 11 ft near former borings B-3 and B-4 to target PCE impact. The excavation also extended under the wall several feet or additional source removal. The proposed interim remediation will further target shallow residual PCE in this vicinity.

Underground Utilities: Once in the subsurface, PCE vapors likely migrated along preferential pathways, such as the sanitary sewer backfill material and the subslab baserock. The subslab baserock material is approximately 3 inches thick at 1185 and 1187 Solano, and no footing is present between these two units to help impede PCE migration. The footing present between 1187 Solano and 1191 Solano (and the higher elevation at 1191 Solano) likely explains the relatively limited impact detected at the adjacent 1191 Solano unit (Post Office) despite the close proximity to the former PCE-using equipment. Reportedly, significant water flooding occurred within 1187 Solano in the past due to a leak from the city-supplied water. It is possible that water entered the subslab area and helped distribute PCE impact within preferential pathways. This could explain shallow soil impacted detected about 1 ft deep in borings in 1185 Solano (which is targeted by planned interim remediation). The shallow PCE impact in soil could also be due to PCE migration in vapor phase within the overlying subslab baserock. The relatively limited PCE impact detected in subslab gas along the sanitary sewer within 1183 Solano (where it exits toward Solano Avenue) could be explained by limited PCE impact migrating within the sewer backfill material. Existing and proposed subslab ventilation piping can be used to remove this residual PCE and associated vapors. A suspected footing between 1183 and 1185 Solano could have helped limite PCE migration toward 1183 Solano.

Limited PCE Volatilization from Groundwater: The subslab gas PCE concentrations do not correlate well with underlying PCE concentrations in groundwater. This suggests that subslab PCE concentrations are likely due to migration along shallower preferential pathways such as utility conduit backfill material or subslab baserock material, and not from volatilization from groundwater. The RWQCB established a conservative screening level of 630 microgram/liter (ug/L) for PCE in groundwater that is protective of vapor intrusion into indooor air from groundwater. Most groundwater impact is well below this screening level, as shown on Figure 3. In addition, the shallow clayey soil at the site will tend to mitigate PCE vapor migration from groundwater into shallower soil. Therefore, vapor intrusion from groundwater does not appear to be a significant concern.

Limited Impact at Adjacent Units: Limited PCE impact in residual soil and groundwater beneath 1191 Solano suggests limited PCE impact beneath this unit. Limited PCE impact in subslab gas within 1183 Solano suggests limited PCE impact beneath this unit also.

Based on this conceptual site model, excavation of shallow soil impact under 1185 Solano is an appropriate method to remove residual PCE impact. To further safeguard human health, subslab depressurization/extraction (active venting) is approprate to further remediate residual PCE vapors and mitigate the potential for vapor intrusion into indoor air for units at 1183 through 1191 Solano Avenue. Vacuum influence monitoring suggests that the existing ventilation system can effectively mitigate potential vapor intrusion at 1185 Solano, 1187 Solano, the northern portion of 1191 Solano, and a portion of 1183 Solano. To enhance the effectiveness of the subslab depressurization/ventilation system, additional ventilation piping installation is proposed below.

Proposed Excavation

Excavation is proposed to remove shallow soil beneath 1185 Solano that is offgassing PCE vapors. The proposed excavation area is shown on Figure 6. To target known PCE impact in soil, initial excavation will remove soil to a depth of approximately 2 ft below grade. Additional deeper soil will be removed based on PID readings or analytical results. Some deeper excavation is anticipated near the '1185 Hall' vent where elevated PCE vapor was detected in the vent piping which is screened from approximately 3 to 5 ft bgs. The excavation goal is to remove all shallow soil to at least 2 ft depth within the proposed area, any encountered deeper soil impact, and soil surrounding underground conduits/pathwaays where preferential PCE imgration may have occurred.

The *southern* extent of the planned excavation area is currently unimproved and accessible for excavation upon removal of the slab. The *northern* and *eastern* extent of the excavation is beneath recent improvements: tiled bathrooms and a hallway sloped for wheelchair access. The concrete slab will be sawcut along the perimeter of the planned excavation in 1185 Solano. A Bobcat will be used to break concrete, excavate shallow soil, and transport soil to the soil stockpile location in the rear parking lot. (To provide access for the Bobcat, the rear door at 1187 Solano will be removed again, and a section of the wall between 1185 and 1187 Solano will be opened). Excavation using hand tools will also be used near underground utilities and areas inaccessible by the Bobcat.

To access soil under the improved areas, an auger (up to 18 inches in diameter) and extensions will be placed on the Bobcat, consistent with techniques used to excavate soil under the 1191 Solano unit. As also performed under the footing and the 1191 Solano unit, excavation may be performed in sections about 6 ft wide followed by backfilling with a 2- or 3-sack cement slurry for floor support. After sufficient drying of the slurry, one or two adjacent sections will be excavated and backfilled. To help evenly distribute the slurry under the improved areas, our contractor will use vibration equipment and extend the slurry about 1 ft above the concrete slab for added pressure.

Soil excavation activites will include the following:

- Coordination with client/property owner and client representatives,
- Notification to adjacent tenants by property owner,
- Excavation planning with contractors and analytical laboratory,
- Excavation by appropriately licensed excavation contractor (Sustainable Technologies),
- Preparation of a health and safety plan for excavation work,
- Notification to Underground Service Alert (USA) at least 72 hours in advance,
- Location of utilities with a private line locator, if necessary,
- Monitoring of indoor air with a photo-ionization device (PID) and personnel monitoring devices,
- Collection of excavation floor compliance soil samples,
- Coordination of soil profiling and offsite disposal,
- Backfilling with cement slurry as merited,
- Backfilling with base rock, clean import material, or sand, and compaction.

Compliance Sampling

Approximately eight compliance soil samples (about 1 every 50 cubic feet) will be collected from the excavation floor. If soil contained PCE concentrations exceeding the final residential ESL for shallow soil of 0.43 mg/Kg (protective of direct contact), additional soil excavation and compliance sampling will be performed. PID readings will be used to help screen soil for excavation prior to compliance sampling.

All soil samples will be collected in stainless steel tubes hammered into the soil and capped with Teflon tape and plastic end caps. Samples will be placed into a cooler filled with ice and delivered under chain-of-custody procedures to a State-certified laboratory. Soil sampling will be performed in accordance with Pangea’s *Standard Excavation Sampling Procedures* presented in Appendix A. Compliance soil samples will be analyzed for volatile organic compounds (VOCs) by EPA Method 8260B (using EPA Method 8010 reporting list to control cost).

Backfilling

The excavation area under the improved area will be backfilled with a cement slurry, completed in sections about 6 ft wide or less. A 2- or 3-sack cement slurry will be used. To help evenly distribute the slurry under the improved areas, our contractor will use vibration equipment and extend the slurry about 1 ft above the concrete slab for added pressure.

For the unimproved areas, a recycled base rock or clean imported sand will be compacted in 8” lifts. The backfill material will be compacted with a 30” sheep foot roller. Alternatively, a cement slurry may be used as backfill to avoid compaction and help provide additional mitigation of subsurface PCE vapors. About 3 inches of baserock will be used to allow vapor collection under the future concrete slab. If needed, an emulsified asphaltic vapor barrier (e.g., GeoSeal) can be applied to the top of the concrete slab in the future.

Soil Management and Disposal

Soil will be stockpiled in the parkling lot consistent with prior excavation efforts. The stockpile will be covered with plastic sheeting. Caution tape will be used to establish an exclusion zone for site construction work. Straw bails and drain covers will be used to control sediment runoff.

Soil stockpiled will be loaded transported to the Clean Harbors Buttonwillow, LLC hazardous waste treatment, storage, and disposal facility in Buttonwillow, California for disposal as Class I RCRA hazardous waste (F-listed waste). The Department of Toxics Substances Control issued EPA (RCRA) ID# CAP000234476 under RCRA Site Name Albany 1-Hour Cleaners.

PROPOSED ADDITIONAL VENT PIPING INSTALLATION

To help minimize the potential for PCE vapor intrusion at 1183 and 1191 Solano, Pangea proposes to install two additional vent wells under 1183 Solano and one additional vent well under 1191 Solano. Planned expansion of the existing subslab depressurization system is illustrated on Figure 6. Like the exsting vent piping, the ventilation piping/wells consist of 4-inch diameter slotted schedule 40 PVC piping, wrapped with geotextile material. One end of each 'vent' will be capped, and the other plumbed with 2-inch diameter solid schedule 40 PVC to the vent piping manifold within the western wall of 1187 Solano. Ball valves and sampling ports will be located within fire-rated enclosures at the vent piping manifold to allow monitoring and adjustment of extracted subslab vapors. Bentonite plugs will be installed at the end of each vent to help minimize the potential for vapor flow short-circuiting within the subsurface. In addition, following the excavation under 1185 Solano, replacement vent wells will be installed to replace the '1185 Bath' and '1185 Hall' vent wells.

Following installation of the additional vent piping, Pangea will conduct a brief vent test to measure vacuum influence in 1183 and 1191 Solano units.

PROPOSED ADDITIONAL SUBSLAB SAMPLING

To further characterize the extent of PCE in subslab gas, Pangea proposes to perform additional subslab sampling from the three following locations: existing subslab probes SS-9 and SS-19, and a proposed probe south of SSPO-2 in 1191 Solano. Probe SS-9 was found clogged during the July 2013 sampling event and unsuccessfully sampled. Probe SS-16 was sampled using a Tedlar bag and reported a PCE concentration of <250 milligrams/cubic meter ($\mu g/m^3$), so probe sampling with a Summa canister will allow evaluation of PCE vapor down to a reporting limit of approximately 14 $\mu g/m^3$. Proposed probe SSPO-5 within 1191 Solano will allow assessment of subslab gas conditions within the southern portion of the Post Office.

Probe installation and sampling will be performed in accordance with procedures described in Pangea's *Assessment Workplan* dated June 17, 2013. Samples will be collected using Summa canisters and analyzed by modified Total Organics Method 15 (TO-15) for volatile organic compounds (VOCs).

REPORT PREPARATION

Upon completion of the interim remediation, additional subslab testing, and indoor air testing, Pangea plans to prepare a *Soil and Water Investigation/Conceptual Site Model (SWI/CSM)* report to comprehensively document site conditions and prior site activity. The ACEH also requested a *Feasibility Study/Corrective Action Plan* to accompany the SWI/CSM and to present the recommended corrective action approach for residual PCE impact.

REFERENCES

Avalon Environmental Consultants, 2004, (Avalon, 2004), *Phase II Subsurface Site Assessment*, November 10.

Avalon Environmental Consultants, 2005, (Avalon, 2005), *Phase II Subsurface Groundwater Assessment*, May 4.

Avalon Environmental Consultants, 2006, (Avalon, 2006), *Soil Gas Investigation and Health Risk Assessment*, June 8.

Pangea Environmental Services, 2013, (Pangea, 2013), *Assessment Workplan*, June 17.

ATTACHMENTS

Figure 1 – Vicinity Map
Figure 2 – PCE in Subslab Soil Gas, July 2-3, 2013
Figure 3 – PCE in Shallow Groundwater
Figure 4 – PCE in Soil Before Excavation
Figure 5 – PCE in Soil, July 2-3, 2013
Figure 6 – Proposed Interim Remediation and Additional Vent Piping

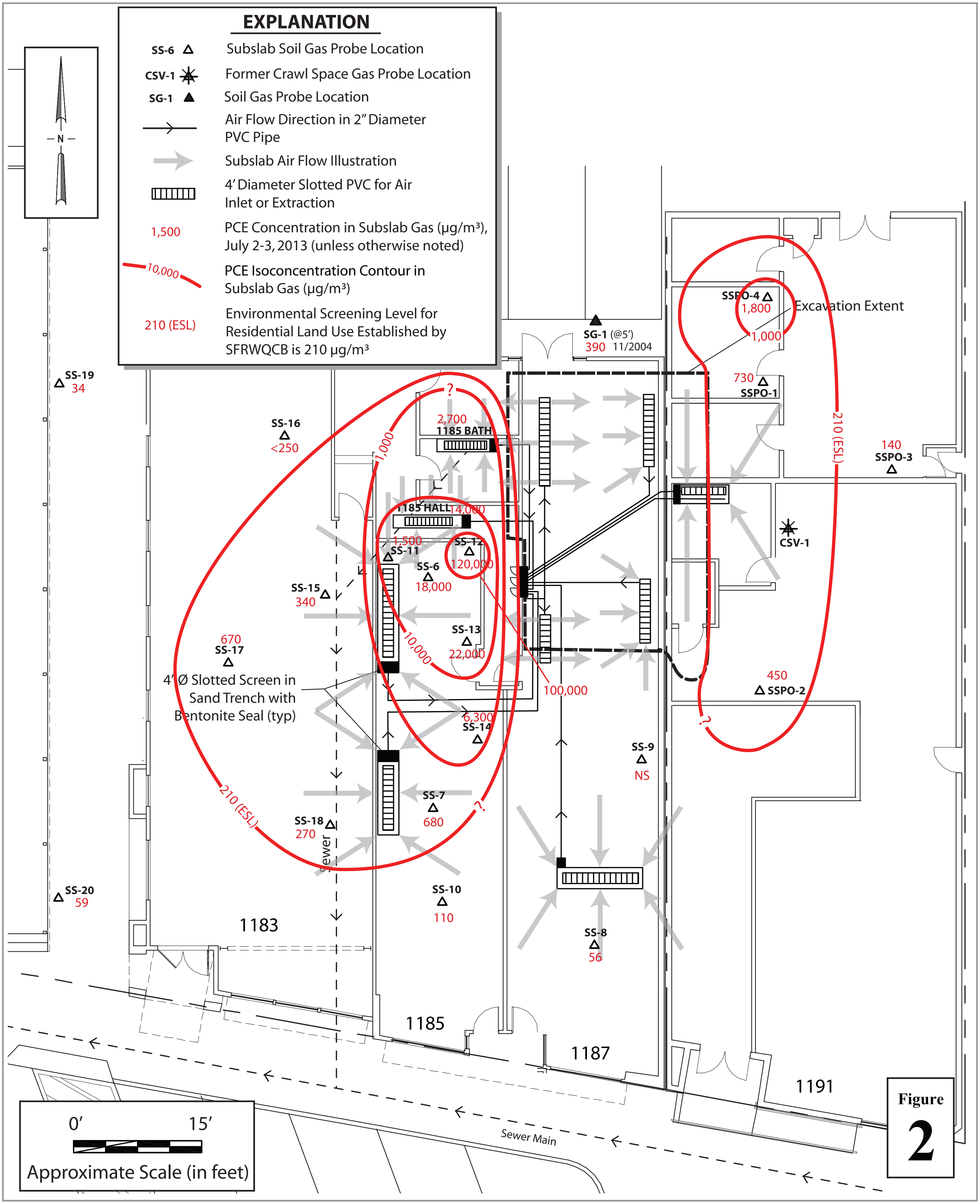
Table 1 – Soil Analytical Data
Table 2 – Groundwater Analytical Data
Table 3 – Soil Gas Analytical Data

Appendix A – Standard Operating Procedures

Solano Group
1187 Solano Avenue
Albany, California

PANGEA

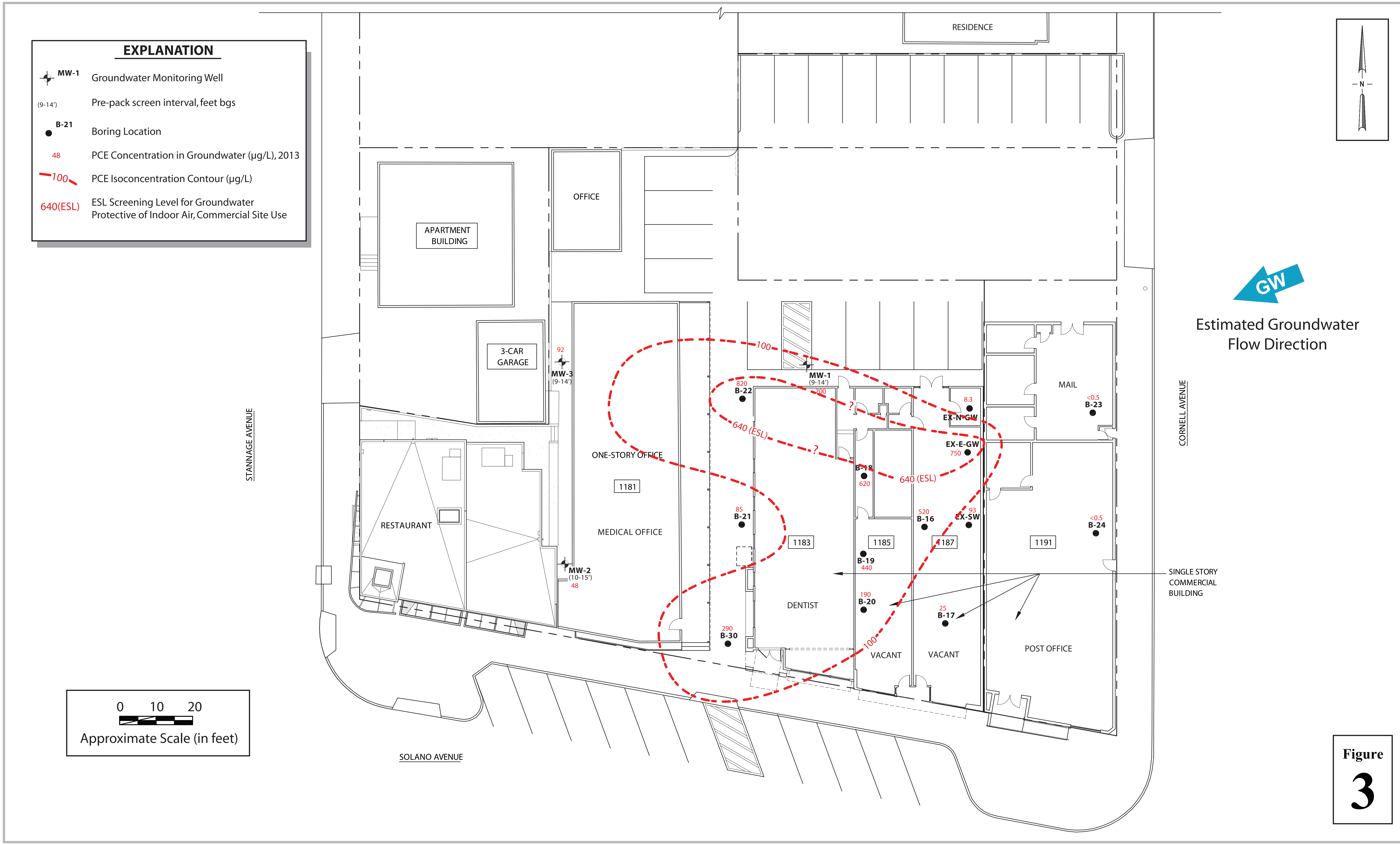
Vicinity Map



Solano Group
1187 Solano Avenue
Albany, California

PANGEA

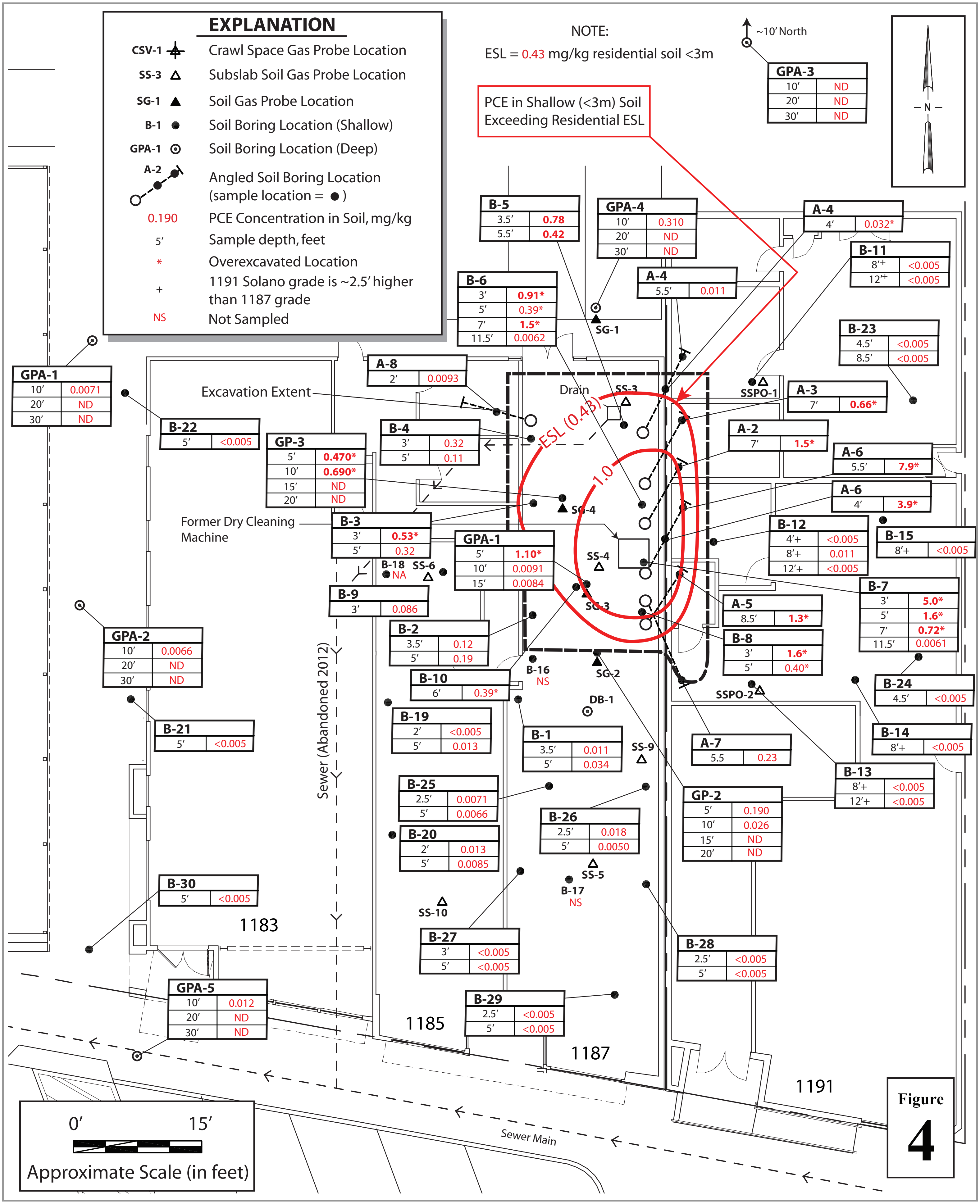
PCE in Subslab Soil Gas
July 2-3, 2013



Solano Group
1187 Solano Avenue
Albany, California

PANGEA

PCE in Shallow (~10') Groundwater



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Albany, California

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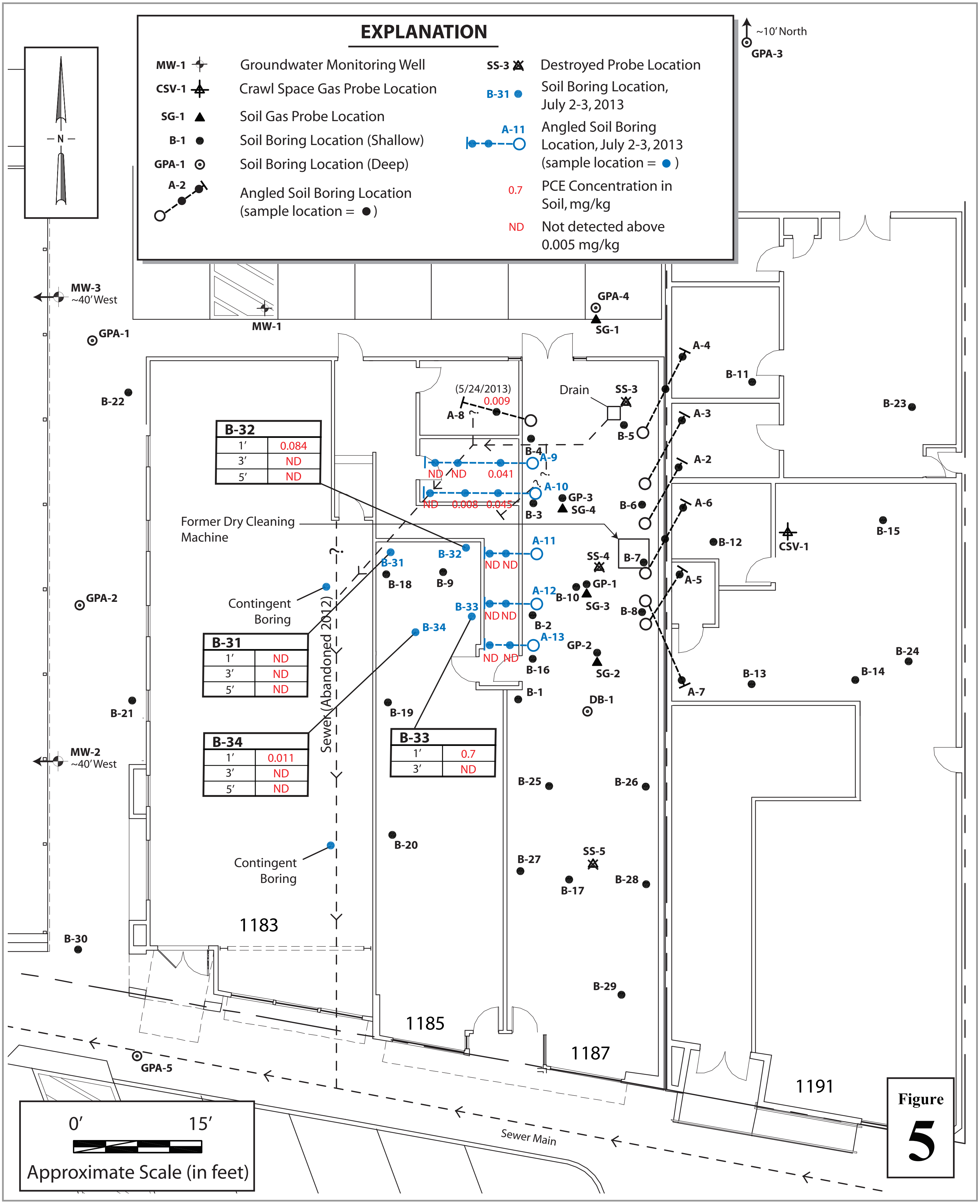
PCE in Soil Before Excavation



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1187 Solano Avenue
Albany, California

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PCE in Soil
July 2-3, 2013

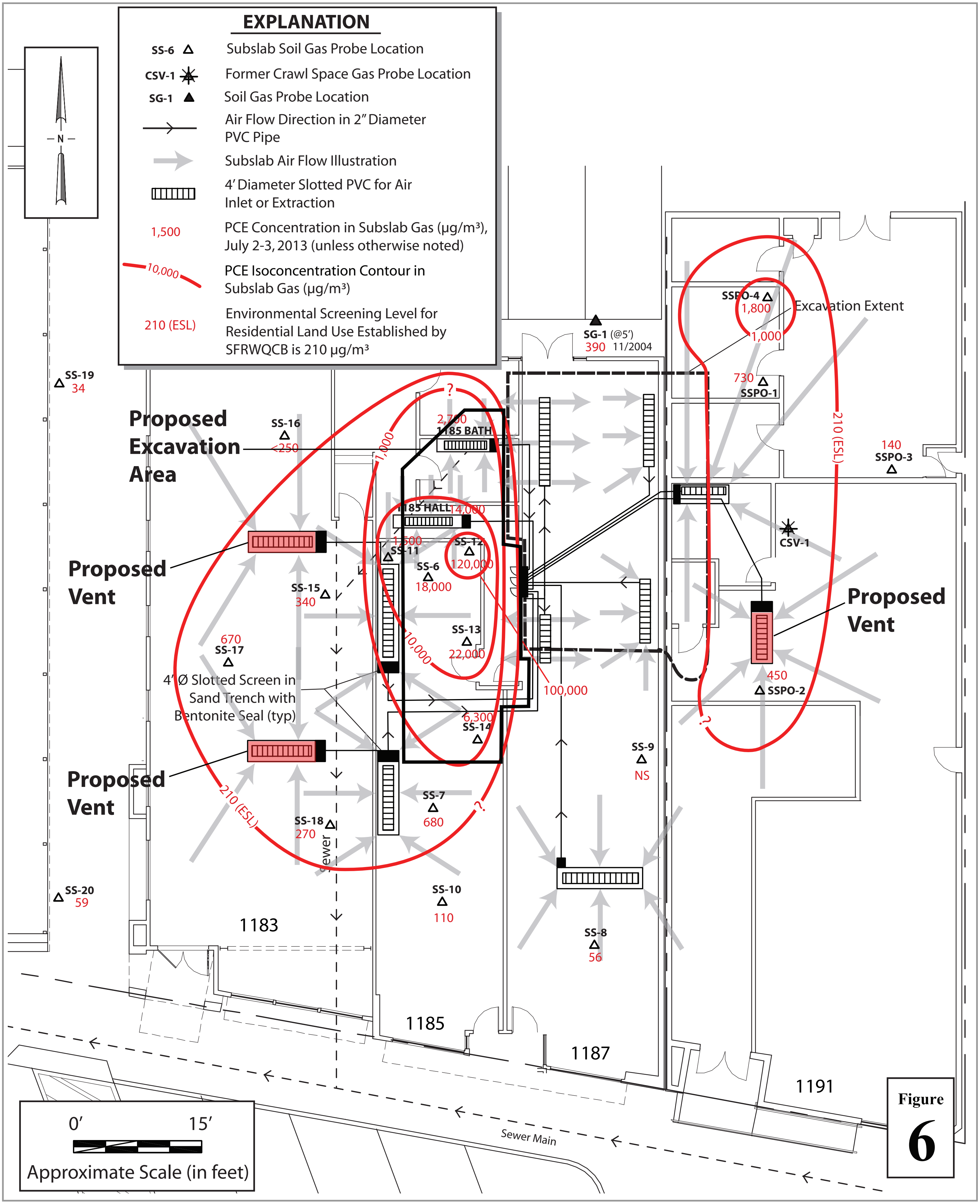

Figure 6

Solano Group
1187 Solano Avenue
Albany, California

PANGEA

Proposed Interim Excavation and Additional Vent Piping

Table 1. Soil Analytical Data - 1187 Solano Ave, Albany, California

			PCE	TCE	cis-1,2-DCE	Other VOCs	Comments
Residential ESL shallow soil **dw** (<3 m bgs) Final ESL:			**0.43**	**0.46**	0.19	Varies	
Residential ESL shallow soil **non-dw** (<3 m bgs) Final ESL:			0.43	1.1	18	Varies	
Residential ESL shallow soil **dw&non-dw** (<3 m bgs) Direct Exp ESL:			0.43	1.1	160	Varies	
Commercial ESL shallow soil **dw** (<3 m bgs) Final ESL:			0.7	0.46	0.19	Varies	
Commercial ESL shallow soil **non-dw** (<3 m bgs) Final ESL:			3.4	5.9	18	Varies	
Residential ESL deep soil **dw** (>3 m bgs) Final ESL:			0.57	0.46	0.19	Varies	
Residential ESL deep soil **non-dw** (>3 m bgs) Final ESL:			**0.57**	**6.7**	18	Varies	
Commercial ESL deep soil **dw** (>3 m bgs) Final ESL:			0.7	0.46	0.67	Varies	
Commercial ESL deep soil **non-dw** (>3 m bgs) Final ESL:			3.4	5.9	18	Varies	
Commercial ESL deep soil **dw & non-dw** (>3 m bgs) Direct Exp. ESL:			0.57	6.7	2,000	Varies	
Boring/ Sample ID	Date Sampled	Sample Depth (ft bgs)	← mg/Kg →				
2004 and 2005 Borings							
GP-1-5'	11/2/2004	5.0	**1.10**	0.0059	ND	ND	**Overexcavated**
GP-1-10'	11/2/2004	10.0	0.0091	ND	ND	ND	**Overexcavated**
GP-1-15'	11/2/2004	15.0	0.0084	ND	ND	ND	
GP-2-5'	11/2/2004	5.0	0.190	0.0022	ND	ND	
GP-2-10'	11/2/2004	10.0	0.026	ND	ND	ND	
GP-2-15'	11/2/2004	15.0	ND	ND	ND	ND	
GP-2-20'	11/2/2004	20.0	ND	ND	ND	ND	
GP-3-5'	11/2/2004	5.0	**0.470**	ND	ND	ND	**Overexcavated**
GP-3-10'	11/2/2004	10.0	**0.690**	ND	ND	ND	**Overexcavated**
GP-3-15'	11/2/2004	15.0	ND	ND	ND	ND	
GP-3-20'	11/2/2004	20.0	ND	ND	ND	ND	
GPA-1-10'	4/20/2005	10.0	0.0071	ND	ND	ND	
GPA-1-20'	4/20/2005	20.0	ND	ND	ND	ND	
GPA-1-30'	4/20/2005	30.0	ND	ND	ND	ND	
GPA-2-10'	4/20/2005	10.0	0.0066	ND	ND	ND	
GPA-2-20'	4/20/2005	20.0	ND	ND	ND	ND	
GPA-2-30'	4/20/2005	30.0	ND	ND	ND	ND	
GPA-3-10'	4/20/2005	10.0	ND	ND	ND	ND	
GPA-3-20'	4/20/2005	20.0	ND	ND	ND	ND	
GPA-3-30'	4/20/2005	30.0	ND	ND	ND	ND	
GPA-4-10'	4/20/2005	10.0	0.310	ND	ND	ND	
GPA-4-20'	4/20/2005	20.0	ND	ND	ND	ND	
GPA-4-30'	4/20/2005	30.0	ND	ND	ND	ND	
GPA-5-10'	4/20/2005	10.0	0.012	ND	ND	ND	
GPA-5-20'	4/20/2005	20.0	ND	ND	ND	ND	
GPA-5-30'	4/20/2005	30.0	ND	ND	ND	ND	
January 2013 Borings							
B-1-3.5	1/10/2013	3.5-4.0	0.011	<0.005	<0.005	ND	
B-1-5.5	1/10/2013	5.0-5.5	0.034	0.0051	<0.005	ND	
B-2-4*	1/10/2013	3.5-4.0	0.12	0.046	0.022	ND	**Overexcavated**
B-2-5.5*	1/10/2013	5.0-5.5	0.19	0.025	0.010	ND	**Overexcavated**
B-3-3.5*	1/10/2013	3.0-3.5	**0.53**	<0.025	<0.025	ND	**Overexcavated**
B-3-5.5*	1/10/2013	5.0-5.5	0.32	<0.020	<0.020	ND	**Overexcavated**

Table 1. Soil Analytical Data - 1187 Solano Ave, Albany, California

			PCE	TCE	cis-1,2-DCE	Other VOCs	Comments
Residential ESL shallow soil **dw** (<3 m bgs) Final ESL:			**0.43**	**0.46**	0.19	Varies	
Residential ESL shallow soil **non-dw** (<3 m bgs) Final ESL:			0.43	1.1	18	Varies	
Residential ESL shallow soil **dw&non-dw** (<3 m bgs) Direct Exp ESL:			0.43	1.1	160	Varies	
Commercial ESL shallow soil **dw** (<3 m bgs) Final ESL:			0.7	0.46	0.19	Varies	
Commercial ESL shallow soil **non-dw** (<3 m bgs) Final ESL:			3.4	5.9	18	Varies	
Residential ESL deep soil **dw** (>3 m bgs) Final ESL:			0.57	0.46	0.19	Varies	
Residential ESL deep soil **non-dw** (>3 m bgs) Final ESL:			**0.57**	**6.7**	18	Varies	
Commercial ESL deep soil **dw** (>3 m bgs) Final ESL:			0.7	0.46	0.67	Varies	
Commercial ESL deep soil **non-dw** (>3 m bgs) Final ESL:			3.4	5.9	18	Varies	
Commercial ESL deep soil **dw & non-dw** (>3 m bgs) Direct Exp. ESL:			0.57	6.7	2,000	Varies	
Boring/ Sample ID	Date Sampled	Sample Depth (ft bgs)	←	mg/Kg	→		
B-4-3.5*	1/10/2013	3.0-3.5	0.32	<0.020	<0.020	ND	**Overexcavated**
B-4-5.5*	1/10/2013	5.0-5.5	0.11	<0.005	<0.005	ND	**Overexcavated**
B-5-3.5*	1/10/2013	3.0-3.5	**0.78**	<0.050	<0.050	ND	**Overexcavated**
B-5-5.5*	1/10/2013	5.0-5.5	0.42	<0.033	<0.033	ND	**Overexcavated**
B-6-3.5*	1/10/2013	3.0-3.5	**0.91**	<0.10	<0.10	ND	**Overexcavated**
B-6-5.5*	1/10/2013	5.0-5.5	0.39	<0.025	<0.025	ND	**Overexcavated**
B-6-7.5*	1/10/2013	7.0-7.5	**1.5**	<0.20	<0.20	ND	**Overexcavated**
B-6-12*	1/18/2013	11.5-12.0	0.0062	<0.005	<0.005	ND	
B-7-3.5*	1/10/2013	3.0-3.5	**5.0**	<0.20	<0.20	ND	**Overexcavated**
B-7-5.5*	1/10/2013	5.0-5.5	**1.6**	<0.10	<0.10	ND	**Overexcavated**
B-7-7.5*	1/10/2013	7.0-7.5	**0.72**	<0.10	<0.10	ND	**Overexcavated**
B-7-12	1/18/2013	11.5-12.0	0.0061	<0.005	<0.005	ND	
B-8-3.5*	1/10/2013	3.0-3.5	**1.6**	<0.10	<0.10	ND	**Overexcavated**
B-8-5.5*	1/10/2013	5.0-5.5	0.40	<0.025	<0.025	ND	**Overexcavated**
B-9-3	1/10/2013	2.5-3.0	0.086	<0.005	<0.005	ND	1185 Solano
B-10-6*	1/10/2013	5.5-6.0	0.39	<0.033	<0.033	ND	**Overexcavated**
B-11-8	1/18/2013	$7.5\text{-}8.0^{+}$	<0.005	<0.005	<0.005	ND	1191 Solano
B-11-12	1/18/2013	$11.5\text{-}12.0^{+}$	<0.005	<0.005	<0.005	ND	1191 Solano
B-12-4	1/18/2013	$3.5\text{-}4.0^{+}$	<0.005	<0.005	<0.005	ND	1191 Solano
B-12-8	1/18/2013	$7.5\text{-}8.0^{+}$	0.011	<0.005	<0.005	ND	1191 Solano
B-12-12	1/18/2013	$11.5\text{-}12.0^{+}$	<0.005	<0.005	<0.005	ND	1191 Solano
B-13-8	1/18/2013	$7.5\text{-}8.0^{+}$	<0.005	<0.005	<0.005	ND	1191 Solano
B-13-12	1/18/2013	$11.5\text{-}12.0^{+}$	<0.005	<0.005	<0.005	ND	1191 Solano
B-14-8	1/18/2013	$7.5\text{-}8.0^{+}$	<0.005	<0.005	<0.005	ND	1191 Solano
B-15-8	1/18/2013	$7.5\text{-}8.0^{+}$	<0.005	<0.005	<0.005	ND	1191 Solano
February 2013 Borings (Angled Under Wall onto 1191 Solano property)							
A-2-11*	2/1/2013	7.0	**1.5**	<0.10	<0.10	ND	**Overexcavated**
A-3-11*	2/1/2013	7.0	**0.66**	<0.20	<0.20	ND	**Overexcavated**
A-4-6*	2/1/2013	4.0	0.032	0.013	<0.005	ND	**Overexcavated**
A-4-9*	2/8/2013	5.5	0.011	0.005	<0.005	ND	

Pangea

Table 1. Soil Analytical Data - 1187 Solano Ave, Albany, California

			PCE	TCE	cis-1,2-DCE	Other VOCs	Comments
Residential ESL shallow soil **dw** (<3 m bgs) Final ESL:			**0.43**	**0.46**	0.19	Varies	
Residential ESL shallow soil **non-dw** (<3 m bgs) Final ESL:			0.43	1.1	18	Varies	
Residential ESL shallow soil **dw&non-dw** (<3 m bgs) Direct Exp ESL:			0.43	1.1	160	Varies	
Commercial ESL shallow soil **dw** (<3 m bgs) Final ESL:			0.7	0.46	0.19	Varies	
Commercial ESL shallow soil **non-dw** (<3 m bgs) Final ESL:			3.4	5.9	18	Varies	
Residential ESL deep soil **dw** (>3 m bgs) Final ESL:			0.57	0.46	0.19	Varies	
Residential ESL deep soil **non-dw** (>3 m bgs) Final ESL:			**0.57**	**6.7**	18	Varies	
Commercial ESL deep soil **dw** (>3 m bgs) Final ESL:			0.7	0.46	0.67	Varies	
Commercial ESL deep soil **non-dw** (>3 m bgs) Final ESL:			3.4	5.9	18	Varies	
Commercial ESL deep soil **dw & non-dw** (>3 m bgs) Direct Exp. ESL:			0.57	6.7	2,000	Varies	
Boring/ Sample ID	Date Sampled	Sample Depth (ft bgs)	←	mg/Kg	→		
A-5-13*	2/1/2013	8.5	**1.3**	<0.05	<0.05	ND	**Overexcavated**
A-6-6*	2/1/2013	4.0	**3.9**	<0.2	<0.2	ND	**Overexcavated**
A-6-10*	2/1/2013	5.5	**7.9**	<0.5	<0.5	ND	**Overexcavated**
A-7-9*	2/8/2013	5.5	0.23	<0.010	<0.010	ND	**Overexcavated**
February and March 2013 Excavation Boundary							
EX-SE-5	2/15/2013	5.0	0.012	<0.005	<0.005	ND	
EX-SE2-6	2/18/2013	6.0	<0.005	<0.005	<0.005	ND	
EX-E-7	2/18/2013	7.0	0.055	<0.005	<0.005	ND	
EX-N-8	2/22/2013	8.0	<0.005	<0.005	<0.005	ND	
EX-F1-11	3/5/2013	11.0	0.083	<0.005	<0.005	ND	
EX-F2-7	3/5/2013	7.0	0.025	<0.005	<0.005	ND	
SW-1-4	3/5/2013	4.0	0.021	<0.005	<0.005	ND	
EX-F3-6	3/6/2013	6.0	**0.57**	<0.005	<0.005	ND	**Overexcavated**
EX-F3-8	3/12/2013	8.0	0.36	<0.005	<0.005	ND	
EX-F4-6	3/6/2013	6.0	0.20	<0.005	<0.005	ND	
EX-F5-9	3/7/2013	9.0	0.0077	<0.005	<0.005	ND	
EX-F6-12	3/7/2013	12.0	0.0066	<0.005	<0.005	ND	
EX-F7-4	3/8/2013	4.0	0.15	<0.005	<0.005	ND	
SW-2-4	3/11/2013	4.0	0.16	<0.005	<0.005	ND	
SW-3-4	3/11/2013	4.0	0.10	<0.005	<0.005	ND	
EX-F8-11	3/13/2013	11.0	0.059	<0.005	<0.005	ND	
EX-F9-11	3/14/2013	11.0	0.026	<0.005	<0.005	ND	
SW-4-5	3/14/2013	5.0	0.016	<0.005	<0.005	ND	
SW-5-2	3/14/2013	2.0	0.12	<0.005	<0.005	ND	
SW-6-2	3/14/2013	2.0	0.12	<0.005	<0.005	ND	
SW-7-5	3/14/2013	5.0	0.047	<0.005	<0.005	ND	
SW-8-1	3/16/2013	1.0	0.12	<0.005	<0.005	ND	
SW-9-1	3/16/2013	1.0	0.096	<0.005	<0.005	ND	
Sewer-1-1	3/16/2013	1.0	0.34	<0.005	<0.005	ND	
Sewer-2-1	3/16/2013	1.0	0.34	<0.005	<0.005	ND	

Table 1. Soil Analytical Data - 1187 Solano Ave, Albany, California

			PCE	TCE	cis-1,2-DCE	Other VOCs	Comments
Residential ESL shallow soil **dw** (<3 m bgs) Final ESL:			**0.43**	**0.46**	0.19	Varies	
Residential ESL shallow soil **non-dw** (<3 m bgs) Final ESL:			0.43	1.1	18	Varies	
Residential ESL shallow soil **dw&non-dw** (<3 m bgs) Direct Exp ESL:			0.43	1.1	160	Varies	
Commercial ESL shallow soil **dw** (<3 m bgs) Final ESL:			0.7	0.46	0.19	Varies	
Commercial ESL shallow soil **non-dw** (<3 m bgs) Final ESL:			3.4	5.9	18	Varies	
Residential ESL deep soil **dw** (>3 m bgs) Final ESL:			0.57	0.46	0.19	Varies	
Residential ESL deep soil **non-dw** (>3 m bgs) Final ESL:			**0.57**	**6.7**	18	Varies	
Commercial ESL deep soil **dw** (>3 m bgs) Final ESL:			0.7	0.46	0.67	Varies	
Commercial ESL deep soil **non-dw** (>3 m bgs) Final ESL:			3.4	5.9	18	Varies	
Commercial ESL deep soil **dw & non-dw** (>3 m bgs) Direct Exp. ESL:			0.57	6.7	2,000	Varies	
Boring/ Sample ID	Date Sampled	Sample Depth (ft bgs)	←	mg/Kg	→		
March and April Borings 2013							
B-19-2	3/20/2013	1.5-2.0	<0.005	<0.005	<0.005	ND	
B-19-5	3/20/2013	4.5-5.0	0.013	<0.005	<0.005	ND	
B-20-2	3/20/2013	1.5-2.0	0.013	<0.005	<0.005	ND	
B-20-5	3/20/2013	4.5-5.0	0.0085	<0.005	<0.005	ND	
B-21-5	4/25/2013	4.5-5.0	<0.005	<0.005	<0.005	ND	
B-22-5	4/25/2013	4.5-5.0	<0.005	<0.005	<0.005	ND	
B-23-4.5	4/25/2013	4.0-4.5	<0.005	<0.005	<0.005	ND	
B-23-8.5	4/25/2013	8.0-8.5	<0.005	<0.005	<0.005	ND	
B-24-4.5	4/25/2013	4.0-4.5	<0.005	<0.005	<0.005	ND	
B-25-2.5	4/25/2013	2.0-2.5	0.0071	<0.005	<0.005	ND	
B-25-5	4/25/2013	4.5-5.0	0.0066	<0.005	<0.005	ND	
B-26-2.5	4/25/2013	2.0-2.5	0.018	<0.005	<0.005	ND	
B-26-5	4/25/2013	4.5-5.0	0.0050	<0.005	<0.005	ND	
B-27-3	4/25/2013	2.5-3.0	<0.005	<0.005	<0.005	ND	
B-27-5	4/25/2013	4.5-5.0	<0.005	<0.005	<0.005	ND	
B-28-2.5	4/25/2013	2.0-2.5	<0.005	<0.005	<0.005	ND	
B-28-5	4/25/2013	4.5-5.0	<0.005	<0.005	<0.005	ND	
B-29-2.5	4/25/2013	2.0-2.5	<0.005	<0.005	<0.005	ND	
B-29-5	4/25/2013	4.5-5.0	<0.005	<0.005	<0.005	ND	
B-30-5	4/25/2013	4.5-5.0	<0.005	<0.005	<0.005	ND	
May 2013 Boring (Angled Under Bathroom at 1185 Solano)							
A-8-5	5/24/2013	2.0	0.0093	<0.005	<0.005	ND	
July 2013 Vertical Boring (1185 Solano)							
B-31-1	7/2/2013	1.0-1.5	<0.005	<0.005	<0.005	ND	
B-31-3	7/2/2013	3.0-3.5	<0.005	<0.005	<0.005	ND	
B-31-5	7/2/2013	4.5-5.0	<0.005	<0.005	<0.005	ND	
B-32-1	7/2/2013	1.0-1.5	0.084	<0.005	<0.005	ND	
B-32-3	7/2/2013	3.0-3.5	<0.005	<0.005	<0.005	ND	
B-32-5	7/2/2013	4.5-5.0	<0.005	<0.005	<0.005	ND	
B-33-1	7/2/2013	1.0-1.5	**0.70**	0.16	<0.050	ND	
B-33-3	7/2/2013	3.0-3.5	<0.005	<0.005	<0.005	ND	
B-34-1	7/2/2013	1.0-1.5	0.011	<0.005	<0.005	ND	
B-34-3	7/2/2013	3.0-3.5	<0.005	<0.005	<0.005	ND	
B-34-5	7/2/2013	4.5-5.0	<0.005	<0.005	<0.005	ND	
July 2013 Boring (Angled Under Wall onto 1185 Solano)							
A-9-3	7/2/2013	1.5	0.041	<0.005	<0.005	ND	
A-9-9	7/2/2013	3.0	<0.005	<0.005	<0.005	ND	
A-9-12	7/2/2013	4.5	<0.005	<0.005	<0.005	ND	
A-10-3	7/2/2013	1.0	0.045	<0.005	<0.005	ND	
A-10-6.5	7/2/2013	2.0	0.0079	<0.005	<0.005	ND	
A-10-12	7/2/2013	3.0	<0.005	<0.005	<0.005	ND	

Table 1. Soil Analytical Data - 1187 Solano Ave, Albany, California

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Residential ESL shallow soil **dw** (<3 m bgs) Final ESL:			**0.43**	**0.46**	0.19	Varies	
Residential ESL shallow soil **non-dw** (<3 m bgs) Final ESL:			0.43	1.1	18	Varies	
Residential ESL shallow soil **dw&non-dw** (<3 m bgs) Direct Exp ESL:			0.43	1.1	160	Varies	
Commercial ESL shallow soil **dw** (<3 m bgs) Final ESL:			0.7	0.46	0.19	Varies	
Commercial ESL shallow soil **non-dw** (<3 m bgs) Final ESL:			3.4	5.9	18	Varies	
Residential ESL deep soil **dw** (>3 m bgs) Final ESL:			0.57	0.46	0.19	Varies	
Residential ESL deep soil **non-dw** (>3 m bgs) Final ESL:			**0.57**	**6.7**	18	Varies	
Commercial ESL deep soil **dw** (>3 m bgs) Final ESL:			0.7	0.46	0.67	Varies	
Commercial ESL deep soil **non-dw** (>3 m bgs) Final ESL:			3.4	5.9	18	Varies	
Commercial ESL deep soil **dw & non-dw** (>3 m bgs) Direct Exp. ESL:			0.57	6.7	2,000	Varies	
Boring/ Sample ID	Date Sampled	Sample Depth (ft bgs)	← mg/Kg →				
A-11-3	7/2/2013	2.0	<0.005	<0.005	<0.005	ND	
A-11-8	7/3/2013	5.5	<0.005	<0.005	<0.005	ND	
A-12-5	7/3/2013	2.5	<0.005	<0.005	<0.005	ND	
A-12-8	7/3/2013	4.0	<0.005	<0.005	<0.005	ND	
A-13-3	7/3/2013	1.5	<0.005	<0.005	<0.005	ND	
A-13-8	7/3/2013	4.0	<0.005	<0.005	<0.005	ND	

Explanation:

mg/Kg = milligrams per Kilogram

ft bgs = Depth below ground surface (bgs) in feet.

< n = Chemical not present at a concentration in excess of detection limit shown.

* = Sample location overexcavated.

* = Slab elevation is about 2.5 ft higher in Post Office building than adjacent units at 1185 and 1187 Solano.

-- = Not analyzed or not available.

ESL = Environmental Screening Level for Shallow/Deep Soil with Residential and Commercial/Industrial Land Use, Groundwater is/is not a current or potential source of drinking water. (Table A/Table B/Table C/Table D/Table K-1).

ESL established by the SFBRWQCB, Interim Final - February 2005 and amended in February 2013.

non-dw = groundwater is not a current or potential source of drinking water.

dw = groundwater is a current or potential source of drinking water.

Other VOCs = Volatile Organic Compounds besides PCE, TCE and cis-1,2-DCA by EPA Method 8010.

TCE = Trichloroethane by EPA Method 8010.

PCE = Tetrachloroethene by EPA Method 8010.

cis-1,2-DCE = cis-1,2 - Dichloroethene

Bold concentrations exceed **residential** ESL where groundwater *is* a current or potential source of drinking water.

ND = Not Detected above laboratory reporting limits.

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Table 2. Groundwater Analytical Data - 1187 Solano Ave, Albany, California

Boring/ Sample ID	Date Sampled	Sample Depth (ft bgs)	PCE	TCE	cis-1,2-DCE	Other VOCs	Comments
Final ESL for groundwater, **dw**:			5.0	5.0	6.0	Varies	
Final ESL for groundwater, **non-dw**:			63	130	590	Varies	
Residential ESL GW to Indoor Air:			63	130	---	--	
Commercial ESL GW to Indoor Air:			**640**	**1,300**	--	--	
			←	μg/L		→	
2004 and 2005 Borings							
GPA-1	4/20/2005	---	ND (<1.0?)	ND	ND	ND	
GPA-2	4/20/2005	---	ND (<1.0?)	ND	ND	ND	
GPA-3	4/20/2005	---	ND (<1.0?)	ND	ND	ND	
GPA-4	4/20/2005	---	ND (<1.0?)	ND	ND	ND	
GPA-5	4/21/2005	---	ND (<1.0)	ND	ND	ND	
Pangea Assessment 2013							
EX-SE	2/18/2013	9.0	93	<2.5	<2.5	ND	
EX-N-GW	2/25/2013	9.0	8.3	1.4	0.71	ND	
EX-E-GW	2/25/2013	9.0	**750**	<25	<25	ND	
B-16	3/8/2013	8.5	520	<0.5	<0.5	ND	
B-17	3/8/2013	9.0	25	<0.5	<0.5	ND	
B-18	3/20/2013	9.0	620	<50	<50	ND	
B-19	3/20/2013	9.0	440	<50	<50	ND	
B-20	3/20/2013	9.4	190	7.0	<0.5	ND	
DB-1	3/20/2013	30-40	<0.5	<0.5	<0.5	ND	
B-21	4/25/2013	10.0	85	<2.5	<2.5	ND	
B-22	4/25/2013	10.0	**820**	<50	<50	ND	
B-23	4/25/2013	12.0	<0.5	<0.5	<0.5	ND	
B-24	4/25/2013	12.0	<0.5	<0.5	<0.5	ND	
B-30	4/25/2013	10.0	290	<10	<10	ND	
Monitoring Wells							
MW-1	6/10/2013	9-14	200	42	<10	ND	Little water
MW-2	5/22/2013	10-15	48	<1.2	<1.2	<1.2	Little water
MW-3	5/24/2013	9-14	92	2.9	<2.5	<2.5	Little water

Explanation:

μg/L = Micrograms per Liter

ft bgs = Depth below ground surface (bgs) in feet.

< n = Chemical not present at a concentration in excess of detection limit shown.

-- = Not analyzed or not available.

ESL = Environmental Screening Level for Groundwater, groundwater is a current or potential source of drinking water. (Table F-1a).

ESL = Environmental Screening Level for groundwater, Groundwater is not a current or potential source of drinking water. (Table F-1b).

ESL = Environmental Screening Level for groundwater to indoor air for residential/commercial land use. (Table E-1).

ESL established by the SFBRWQCB, Interim Final - February 2005 and amended in February 2013.

non-dw = groundwater is not a current or potential source of drinking water.

dw = groundwater is a current or potential source of drinking water.

Other VOCs = Volatile Organic Compounds besides PCE, TCE and cis-1,2-DCA by EPA Method 8010.

TCE = Trichloroethane by EPA Method 8010.

PCE = Tetrachloroethene by EPA Method 8010.

cis-1,2-DCE = cis-1,2 - Dichloroethene

Bold concentrations exceed ESL protective of indoor air (commercial).

ND = Not Detected above laboratory reporting limits.

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Table 3. Subslab and Soil Gas Analytical Data - 1185 - 1191 Solano Avenue, Albany, California

Boring/ Sample ID	Date Sampled	Sample Depth (ft bgs)	Tetrachloroethene (PCE)	Trichloroethene (TCE)	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	Other VOCs	Helium	Notes
			ug/m^3					%	
SUBSLAB DEPRESSURIZATION SYSTEM									
INF	4/8/13	0.5	**5,000**	**510**	<250	<250	<250	---	Day 3 (1st). 1185N+S&PO
INF	4/10/13	0.5	**4,400**	**290**	<250	<250	<250	---	Day 5 (1st). 1185N+S&PO
INF	5/2/13	0.5	**1,900**	<250	<250	<250	<250	---	Day 4 (2nd). 1185N+S&PO
INF-PO	4/10/13	0.5	**700**	<250	<250	<250	<250	---	Day 1 - PO Only Test
INF-PO	4/15/13	0.5	**370**	<250	<250	<250	<250	---	Day 5 - PO Only Test
INF-V-1185N	5/13/13	0.5	**1,300**	<250	<250	<250	<250	---	Short Test 1185N Only
SUBSLAB GAS (Immediately Under Concrete Slab)									
1183 Solano Avenue									
SS-15	07/02/13	0.5	**340**	<250	<250	<250	<250	---	
SS-16	07/02/13	0.5	<250	<250	<250	<250	<250	---	
SS-17	07/03/13	0.5	**670**	<11	<8.1	<8.1	See Note L	---	
SS-18	07/03/13	0.5	**270**	<11	<8.1	<8.1	See Note M	---	
1185 Solano Avenue									
SS-6	01/17/13	0.5	**120,000**	**9,100**	270	71	See Note A	---	Before excavation and venting
	04/25/13	0.5	**40,000**	**10,000**	<250	<250	<250		7 days after vent test end
	05/17/13	0.5	**19,000**	**3,800**	<250	<250	<250		Short test
	07/02/13	0.5	**18,000**	**3,100**	<250	<250	<250		
SS-7	01/17/13	0.5	**54,000**	1,600	22	29	See Note B	0.086	Before excavation and venting
	04/25/13	0.5	**2,000**	<250	<250	<250	<250	---	7 days after vent test end
	07/02/13	0.5	**680**	<250	<250	<250	<250	---	
SS-10	04/25/13	0.5	<250	<250	<250	<250	<250	---	7 days after vent test end
	07/03/13	0.5	**110**	<11	<8.1	<8.1	See Note J	---	
SS-11	07/02/13	0.5	**1,500**	<250	<250	<250	<250	---	
SS-12	07/02/13	0.5	**120,000**	**15,000**	<2,500	<2,500	<2,500	---	
SS-13	07/02/13	0.5	**22,000**	**18,000**	3,500	<500	<500	---	
SS-14	07/02/13	0.5	**6,300**	**310**	<250	<250	<250	---	
1185 Hall	07/02/13	0.5	**14,000**	**740**	<250	<250	<250	---	
1185 Bath	07/02/13	0.5	**2,700**	<250	<250	<250	<250	---	
1187 Solano Avenue									
SS-3	01/17/13	0.5	**27,000**	**2,600**	590	92	See Note C	0.041	North - Before excavation
SS-4	01/17/13	0.5	**770,000**	**60,000**	2,200	1,000	See Note D	---	At Former Machine - Before exc.
SS-5	01/17/13	0.5	**190,000**	**6,300**	81	56	ND	---	South - Before excavation

Table 3. Subslab and Soil Gas Analytical Data - 1185 - 1191 Solano Avenue, Albany, California

Boring/ Sample ID	Date Sampled	Sample Depth (ft bgs)	Tetrachloroethene (PCE)	Trichloroethene (TCE)	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	Other VOCs	Helium	Notes
			← ug/m^3 →					%	
SS-8	07/03/13	0.5	**56**	<11	<8.1	<8.1	See Note K	0.21	7 days after vent test end
SS-9	04/25/13	0.5	<250	<250	<250	<250	<250	---	7 days after vent test end
1191 Solano Avenue									
SS-PO-1	01/17/13	0.5	**1,100**	110	18	90	See Note E	---	Before excavation and venting
	04/25/13	0.5	**860**	<250	<250	<250	<250	---	7 days after vent test end
	07/02/13	0.5	**730**	<250	<250	<250	<250	---	
SS-PO-2	01/17/13	0.5	**760**	35	<8.1	28	See Note F	---	Before excavation and venting
	04/25/13	0.5	<250	<250	<250	<250	<250	---	7 days after vent test end
	07/03/13	0.5	**450**	<11	<8.1	<8.1	See Note N	---	
SS-PO-3	07/03/13	0.5	**140**	<11	<8.1	<8.1	See Note O	---	
SS-PO-4	07/03/13	0.5	**1,800**	<11	<8.1	<8.1	See Note P	---	
CSV-1	01/17/13	0.2	<14	<11	<8.1	<8.1	See Note G	---	Crawl Space
Courtyard West of 1191 Solano Avenue									
SS-19	07/03/13	0.5	**34**	<11	<8.1	<8.1	See Note I	---	Courtyard
SS-20	07/03/13	0.5	**59**	<11	<8.1	<8.1	See Note H	---	Courtyard
Residential ESL for subslab gas:			210	300	---	31,000	Varies	NA	
Commercial ESL for subslab gas:			2,100	3,000	---	260,000	Varies	NA	
Residential CHHSL for subslab gas:			8.24	24	730	1,460	Varies	NA	
Commercial CHHSL for subslab gas:			**13.86**	**40.8**	1,020	2,040	Varies	NA	
Residential CHHSL for indoor air:			0.412	1.22	36.5	73	Varies	NA	
Commercial CHHSL for indoor air:			0.693	2.04	51.1	102	Varies	NA	

Table 3. Subslab and Soil Gas Analytical Data - 1185 - 1191 Solano Avenue, Albany, California

Boring/ Sample ID	Date Sampled	Sample Depth (ft bgs)	Tetrachloroethene (PCE)	Trichloroethene (TCE)	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	Other VOCs	Helium	Notes
			← ug/m³				→	%	
SOIL GAS (About 5 feet deep into site soil)									
1187 Solano Avenue									
SG-1	11/02/04	5.0	390	ND	ND	ND	misc	---	Outside
SG-2	11/02/04	5.0	**90,000**	**10,000**	100	390	misc	---	
SG-3	11/02/04	5.0	**100,000**	**7,900**	ND	ND	misc	---	
SG-4	11/02/04	5.0	**170,000**	**5,500**	ND	ND	misc	---	
Residential CHHSL for shallow soil gas:			180	528	15,900	31,900	Varies	NA	
Commercial CHHSL for shallow soil gas:			**600**	**1,770**	44,400	88,700	Varies	NA	
Residential ESL for shallow soil gas:			210	300	---	31,000	Varies	NA	
Commercial ESL for shallow soil gas:			2,100	3,000	---	260,000	Varies	NA	

Abbreviations:

Tetrachloroethene, Trichloroethene, cis-1,2-Dichloroethene, trans-1,2-Dichloroethene, and Helium analyzed by Method TO-15.

Other VOCs = Volatile Organic Compounds except for Tetrachloroethene, Trichloroethene, cis-1,2-Dichloroethene, trans-1,2-Dichloroethene and Helium analyzed by Method TO-15.

ug/m^3 = Micrograms per cubic meter of air.

ft bgs = Depth interval below ground surface (bgs) in feet.

NA= not applicable

ND = not detected above laboratory reporting limits.

< n = Chemical not present at a concentration in excess of detection limit shown.

CHHSL = California Human Health Screening Levels for Soil Gas below buildings constructed without engineered fill below sub-slab gravel with Commercial/Industrial Land Use Updated 9/23/2010. http://oehha.ca.gov/risk/chhsltable.html

CHHSL (subslab) = California Human Health Screening Levels for sublsab gas has an attenuation factor of 0.05 of indoor air screening levels per CalEPA/DTSC Vapor Intrusion Guidance Document, October 2011 (p 21).

ESL = Environmental Screening Level for Soil Gas with Commercial Land Use, Groundwater is/is not a current or potential source of drinking water (Table A-2, Table B-2). Established by the SFBRWQCB, Interim Final - November 2007 (Revised Feb 2013).

Tetrachloroethene also referred to as Perchloroethene, PCE or Perc.

Bold concentrations exceed **commercial** CHHSL.

Note A: 7.2 ug/m^3 benzene and 13 ug/m^3 chloroform

Note B: 7.2 ug/m^3 tetrahydrofuran and 32 ug/m^3 ethyl acetate

Note C: 23 ug/m^3 chloroform

Note D: 28 ug/m^3 benzene, 80 ug/m^3 chloroform, and 49 ug/m^3 1,1-dichloroethene

Note E: 8.1 ug/m^3 tetrahydrofuran and 9.1 ug/m^3 vinyl chloride

Note F: 210 ug/m^3 ethanol and 14 ug/m^3 tetrahydrofuran

Note G: 290 ug/m^3 4-methyl-2-pentanone and 19 ug/m^3 toluene (likely associated with building materials).

Note H: 310 ug/m^3 acetone and 71 ug/m^3 tetraydrofuran

Note I: 250 ug/m^3 acetone, 51 ug/m^3 isopropyl alcohol, 7.1 ug/m^3 carbon disulfide, and 8.9 ug/m^3 4-methyl-2-pentanone

Note J: 390 ug/m^3 acetone, 13 ug/m^3 syrene, and 38 ug/m^3 tetrahydrofuran

Note K: 320 ug/m^3 acetone and 61 ug/m^3 tetrahydrofuran

Note L: 240 ug/m^3 acetone and 39 ug/m^3 tetrahydrofuran

Note M: 200 ug/m^3 acetone, 9.0 ug/m^3 carbon disulfide, and 22 ug/m^3 tetrahydrofuran

Note N: 200 ug/m^3 acetone, 20 ug/m^3 carbon disulfide, and 29 ug/m^3 tetrahydrofuran

Note O: 180 ug/m^3 acetone and 32 ug/m^3 tetrahydrofuran

Note P: 210 ug/m^3 acetone, 51 ug/m^3 ethyl acetate, and 35 ug/m^3 tetrahydrofuran

APPENDIX A

Standard Operating Procedures

STANDARD FIELD PROCEDURES FOR EXCAVATION SAMPLING

During remedial excavation activities compliance sampling is typically required to assess the extent of the contamination remaining in site soil. Pangea has developed standard field procedures for compliance sampling and excavation to provide sample collection, handling and documentation in compliance with State and local regulatory agency regulations.

Soil Sampling

Soil samples are typically collected from the bottom and sidewalls of the excavation. If water is present in the excavation, soil samples are typically collected from the soil/water interface. The soil samples are collected in steam-cleaned brass or steel tubes from either a driven split-spoon type sampler or the bucket of a backhoe or excavator. When a backhoe or excavator is used, approximately three inches of soil are scraped from the surface and the tube is driven into the exposed soil. The location and number of samples is determined by the environmental professional and/or regulatory agency representatives overseeing the excavation.

When required or requested before sample collection, Pangea field staff screen soil with a portable photo-ionization detector (PID) to qualitatively assess the presence or absence of volatile contaminants. Excavated soil is typically segregated based on contaminant concentration and stockpiled on site on plastic sheeting. When field observations and/or PID measurements indicate that the contaminant-bearing soil has been satisfactorily removed, Pangea collects soil samples from excavation sidewalls and floor for confirmatory analysis at a State-certified analytic laboratory.

Stockpile Soil Sampling

To facilitate soil disposal at approved offsite facilities, Pangea typically collects one four-point composite soil samples for 200 cubic yards or less of stockpiled soil. If the soil stockpile volume is between 200 and 1,000 cubic yards, two four-point composite samples are typically collected. If soil is segregated based on field observations, at least one four-point composite soil sample is collected for each segregated stockpile. To generate a composite sample, Pangea collects four individual soil samples in steam-cleaned brass or steel tubes by hand, or from either a driven split-spoon type sampler or the bucket of a backhoe or excavator. The sample locations and depths are selected to obtain composite soil sample representative of the stockpile. The four individual soil tubes are composited by the state-certified laboratory. When hand sampling or backhoe/excavator is used, approximately three inches of soil are scraped from the surface and the tube is driven into the exposed soil. Additional stockpile sampling procedures may be required to facilitate reuse of soil onsite in accordance with regulatory oversight.

Grab Ground Water Sampling

If groundwater enters the excavation, grab ground water samples are typically collected from the open excavation. Grab groundwater sample can be collected from excavator equipment, disposable Tygon® tubing placed into the excavation, or other appropriate sampling equipment placed into the water. The groundwater samples are decanted into the appropriate containers supplied by the analytic laboratory.

Sample Storage, Handling and Transport

Upon removal from the sampler or the backhoe, soil samples are trimmed flush, capped with Teflon tape and plastic end caps. Soil samples are labeled and stored at or below 4^{o}C on either crushed or dry ice, depending upon local regulations. Groundwater samples in appropriate containers are labeled, placed in protective bags, and stored on crushed ice at or below 4^{o} C. All samples are transported under chain-of-custody to a State-certified analytic laboratory.

Duplicates and Blanks

Duplicate or blind duplicate samples can be collected, if requested. For water sampling, laboratory-supplied trip blanks can accompany samples to check for cross-contamination caused by sample handling and transport. These trip blanks are analyzed if the internal laboratory quality assurance/quality control (QA/QC) blanks contain the suspected field contaminants. An equipment blank may also be analyzed if non-dedicated sampling equipment is used.

STANDARD OPERATING PROCEDURE FOR SUBSLAB VAPOR SAMPLING

1.0 PURPOSE

This standard operating procedure (SOP) describes the procedures for collecting subslab vapor samples using evacuated stainless-steel Summa canisters for the purpose of assessing risk to building occupants. The SOP is modified from procedures and information presented in Cal/EPA 2012 (*Advisory-Active Soil Investigations)*; Cal/EPA 2011; Cal/EPA 2010; U.S. EPA, 2006; and DiGiulio, 2003. This SOP includes (a) real-time leak-check procedures to evaluate integrity of the soil gas probe and sampling assembly during probe purging and post sampling, and (b) real-time field screening of soil gas concentrations during probe purging and post sampling.

2.0 REQUIRED EQUIPMENT

- Hammer drill with 1" bit and smaller bits (slightly larger than vapor probe tubing)
- Tubing for cleaning boring
- Stainless-steel or Teflon vapor probe tubing with Swagelok threaded compression fitting, vapor-tight cap, and valves.
- Rubber stopper or Teflon disk
- Granulated bentonite, bentonite pellets and cement
- Vacuum pump with adjustable rotameter for purging and leak testing
- 1-Liter Summa canister for each sample
- Stainless-steel sampling manifold with vacuum gauges and critical orifice flow restrictor (request that laboratory leak-check sampling manifold prior to mobilization)
- Leak-check compound (e.g. helium)
- Helium gas analyzer (calibrated)
- Calibrated photoionization detector (PID) or other organic vapor analyzer
- Isobutylene for PID calibration
- Tedlar bags (for helium measurement and vapor screening)
- Vacuum chamber (iron lung) for pre- and post-sampling leak-check
- Leak-check enclosure (bucket with hydrated bentonite pellets [or weather stripping] for sealing enclosure to surface and openings for vapor probe tubing, helium and for sampling enclosure atmosphere)
- Recordkeeping materials
- Latex or nitrile gloves

3.0 PROCEDURES

3.1 Boring Clearance

Prior to installing subslab vapor probes, ensure that a utility clearance has been conducted to ensure that potential subsurface utility and rebar locations have been identified and marked.

3.2 Vapor Probe Construction

1. To protect interior surfaces, lay plastic sheeting around the probe location.
2. Use a rotary hammer drill to create an approximately 3-inch deep, 1 1/2 -inch diameter hole that *partially* penetrates the slab. Use a piece of flexible tubing to blow or vacuum concrete debris and dust from the hole. Do not blow or vacuum after the slab has been completely penetrated.
3. Drill a smaller diameter *inner hole* in the center of the outer hole, periodically blowing dust and debris from the hole until the slab is penetrated. The diameter of the inner hole should exceed the diameter of the vapor probe tubing by the minimum amount practicable. The inner hole should be drilled completely through the slab and 3 to 4 inches into the subslab material (baserock or soil) to form a cavity (**Figure 1**).
4. Insert the capped vapor probe tubing through a tightly fitting rubber stopper or a Teflon disk and insert the stopper or disk into the bottom of the outer hole. The purpose of the stopper is to stop moisture from the annular seal from leaking into subslab materials. The fitting may either be constructed flush, or may protrude above the slab, depending on location and susceptibility to damage. If a lubricant is needed, use only high-vacuum silicone grease.
5. Clean the concrete surfaces in the borehole with a dampened towel to increase the potential of a good seal. Fill the remainder of the hole with hydrated bentonite (temporary probe) or hydrated bentonite topped with expanding cement (semi-permanent probe). Place a protective cap (temporary probe) or flush mounted well box (semi-permanent probe) over the probe to protect it from damage.

3.3 Vapor Sampling

During vapor sampling, record all valve open/close times and canister/manifold vacuum readings at each step. Do not conduct sampling within **5 days following a significant rain event** (0.5 inches of rainfall during any 24-hour period) or signficant irrigation adjacent to the building.

<u>Setup</u>

1. Calculate and record the volume of the sampling assembly, tubing, vapor probe and void space created in subslab material.

   Volume = $\pi * r^2 * L$ = 3.14 x (1/2*ID) x (1/2*ID) *L,

   where ID = cavity, tubing or manifold inside diameter and L = length of cavity or tubing/manifold segment.
2. Wear latex or nitrile gloves while handling sampling equipment. Change gloves whenever a new sample is collected and after handling leak-check compound.
3. Replace the vapor probe cap with a closed Swagelok valve. Connect the sampling manifold to the vapor probe, sample Summa canister and vacuum pump using Swagelok fittings and stainless-steel, Teflon or Tygon tubing. Check all fittings for tightness (do not overtighten).
4. Close all valves. Record pre-test vacuum readings on summa canister.

Manifold Shut-In Check

1. Open valve on vapor sampling manifold and open 3-way valve #1 so the vacuum pump of the purging assembly can evacuate the vapor sampling manifold assembly (keep valves #2 and #3 closed to the Tedlar bag/vacuum chamber of the vapor screening assembly) (**Figure 2**). Start the vacuum pump. Do *not* open #1 valve to the probe assembly, or the valve on the sample Summa canister. Allow manifold/tubing vacuum to stabilize at approximately 10" Hg.
2. Stop the vacuum pump, close 3-way valves #2 and #3 (to allow shut-in testing of vapor sampling manifold), and conduct a shut-in test by waiting at least **5 minutes** (if using 150 inches of water gauge) or **10 minutes** (if using 30 inches of mercury gauge). Monitor manifold vacuum gauge to test for leaks. If the vacuum decreases, rectify the leak before proceeding.

Purge, Flow and Leak Check

1. **Calculate purge volume and duration**. Determine the desired total purge volume and purging duration for the equipment setup. A critical orifice flow restrictor is intended to limit the maximum purge and sampling flow rate (approximately 150 ml/min). If step testing is not required to better determine optimal purge volume, **purge approximately 3 times** the volume of the sampling assembly, tubing, vapor probe and void space or any probe/filter pack material below the concrete slab.
2. **Leak-check enclosure.** Place leak-check enclosure over vapor probe and seal to floor using hydrated bentonite or weather stripping. Introduce helium gas into the leak-check enclosure and monitor with the helium gas analyzer until it reads between 20% and 30% helium.
3. **Conduct purging.** Start vacuum pump and open 3-way valve #1 (and 3-way valves #2 and #3) so the vacuum pump can evacuate the probe. Do *not* over-purge. Closely monitor the flow on the rotameter and the vacuum on the vacuum gauge. For most samples flow should be limited to 150mL/min or less. If the vacuum remains below approximately 7" Hg, then sufficient flow is present to collect a representative sample (Cal/EPA 2012) and continue purging for the planned purge duration.
4. If the probe-side vacuum exceeds approximately 7" Hg, then insufficient flow may be present to collect a representative sample and this condition should be noted. Evaluate probe integrity or consider re-installation of probe, especially if probe installed in coarse-grain material. If no significant flow is attained, the sampling line may be plugged or the vapor probe may be positioned in a low permeability or saturated layer. If the probe cap is opened for probe inspection, record the inspection procedures and duration. If purging and sampling is resumed after opening the probe cap, this information will help determine the representativeness of the sample. **To sample subslab gas under low flow conditions, follow this alternate sampling method** derived from Appendix D, Cal/EPA 2012. Make a reasonable attempt to purge one purge volume. After purging, open sample Summa canister until sampling manifold vacuum threshold is achieved, then close Summa sample valve until probe vacuum dissipates. Repeat this sampling procedure as necessary to sufficiently fill the sample Summa canister. Alternatively, consider installing a subslab gas probe with a larger probe annulus space, or employing passive soil gas sampling methods.
5. When purge duration complete and ready to discontinue purging, close 3-way valve #1 so that the probe is connected to the sampling manifold, and then stop the vacuum pump.

6. Record helium reading for leak-check enclosure at least once every minute during purging and sampling.

Sample Collection

1. **Opening Sample Canister.** Once a helium reading of at least 20% has been reached, open sample canister valve. **Sampling takes approximately 5 minutes for a 1-liter Summa canister** (at 150 ml/min sampling flow rate).
2. Close sampling canister valve when vacuum decreases to 5" mercury. Do *not* allow vacuum to fall below this range.
3. **Post-Sample Vapor Screening.** After sampling, open 3-way valve #1 so that the vapor screening assembly is connected to the probe, turn on the vacuum pump, and open 3-way valves #2 and #3 to partially fill the Tedlar bag within the vacuum chamber (iron lung). When Tedlar bag is sufficiently filled, return valves #2 and #3 to purging position. Check Tedlar bag for indication of sampling leakage using the helium gas analyzer. If helium concentration is below 1% then sample is sufficiently representative. If helium concentration is above 1%, then the sample may not be sufficiently representative; the probe may need to be repaired or re-installed and re-sampled. Additionally, check the Tedlar bag for contaminants using the PID for qualitative contaminant assessment (optional).
4. **Shroud Sample.** To confirm helium meter readings collect one shroud sample per day to analyze for percent helium. Connect the shroud sample summa canister and manifold to a port near the bottom of the shroud and open the canister valve at the beginning of sampling. Close sampling canister valve when vacuum decreases to 5" mercury. Do *not* allow vacuum to fall below this range. Disassemble sampling assembly, and cap (or remove and restore) vapor sampling point.
5. **Analyses.** Fill out chain-of-custody form for analysis for **chemicals of concern (i.e. TO-15)**, and for **leak-check compound** for at least 10% of samples. Analyze all samples for **percent oxygen** by ASTM D1946-90**.** Additionally, samples may be analyzed for **percent methane and carbon dioxide** by ASTM D1946-90 when in support of sensitive human health risk assessments for regulatory review. Include final vacuum reading and serial numbers of canister and flow restrictor on chain-of-custody form.
6. For vapor sampling in support of sensitive human health risk assessments for regulatory review, collect at least one *duplicate* sample per site per sampling event from the sampling point with the anticipated highest vapor concentrations. The duplicate sample should be collected by attaching a fresh sample canister following collection of the initial sample. If a new manifold is used, follow the same purging and sampling procedures used for the original sample. If the same manifold is used, collect a sample without further purging, using the same sampling procedures used for the original sample.

Decontamination and Decommissioning

1. Use a decontaminated sampling manifold and new tubing for each sample location. Return equipment to laboratory for decontamination.
2. Backfill any open soil vapor probe holes with bentonite slurry or Portland cement and cap with concrete or other surface material to match the area.
3. To retain the subslab probe for future sampling, cap the Swagelock fitting and cover the probe with a small vault or other protective device.

REFERENCES

Cal/EPA, 2012, Advisory-Active Soil Gas Investigation, California Environmental Protection Agency, Department of Toxic Substances Control, Los Angeles Regional Water Quality Control Board, San Francisco Regional Water Quality Control Board, April.

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Dominic DiGiulio, 2003, Standard Operating Procedure (SOP) for installation of sub-slab vapor probes and sampling using EPA Method TO-15 to support vapor intrusion investigations, U.S. Environmental Protection Agency, Office of Research and Development, National Risk Management Research Laboratory, Ground-Water and Ecosystem Restoration Division, Ada, Oklahoma (included as Appendix C of Colorado Department of Public Health and Environment, 2004, Draft Indoor Air Guidance, Hazardous Materials and Waste Division), September.

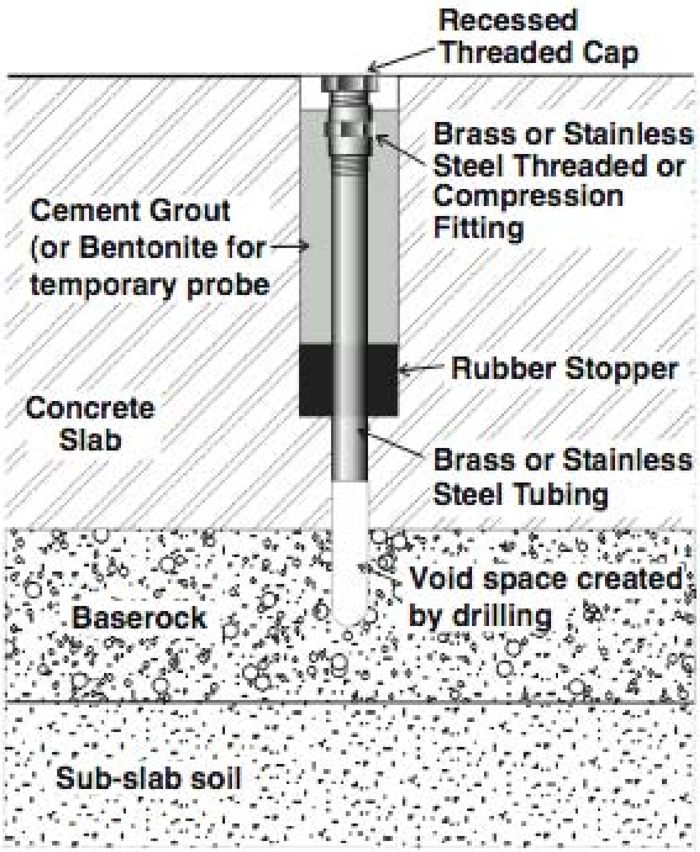

Figure
1

Subslab Vapor Probe Schematic

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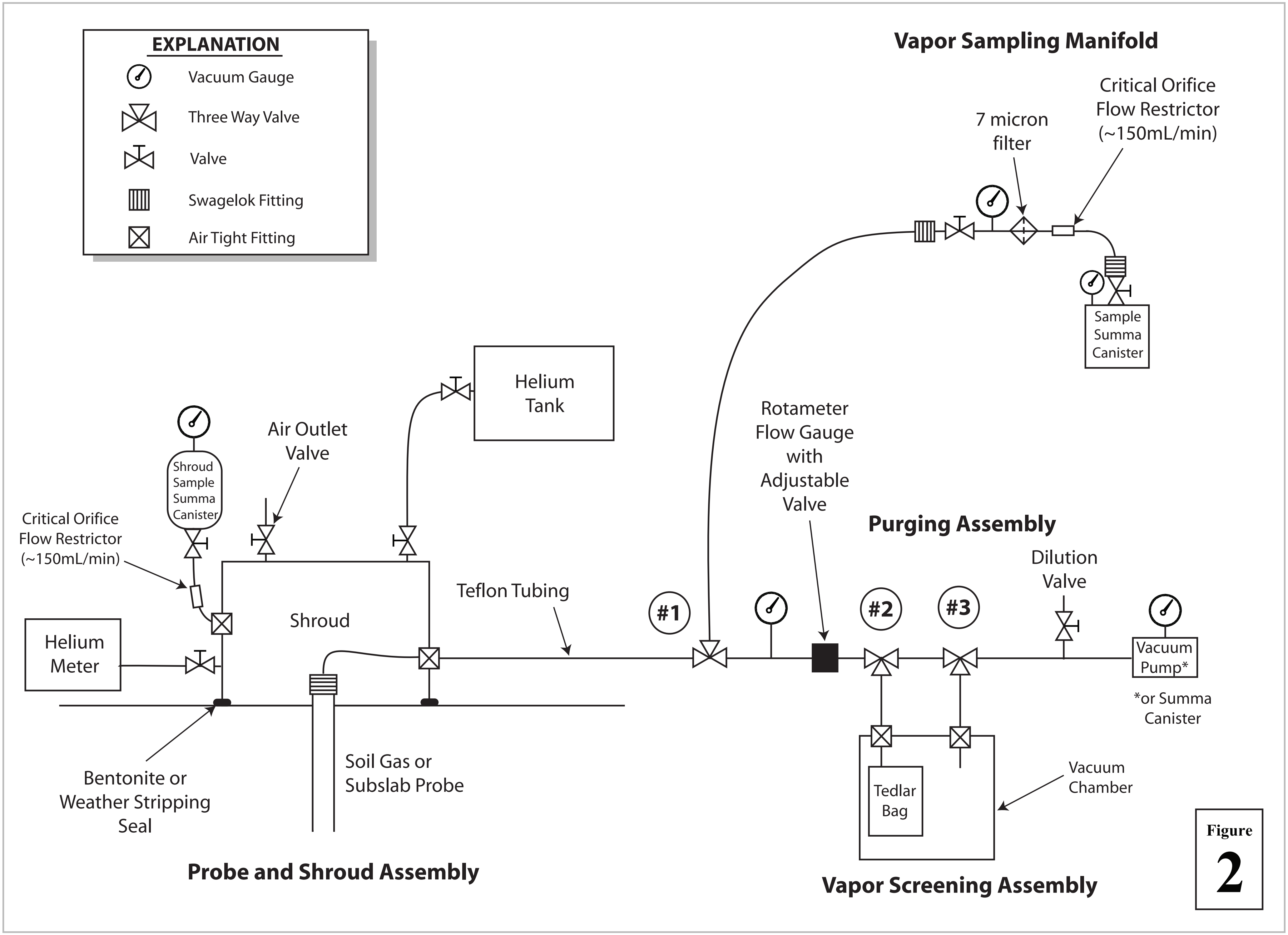

Figure
2

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Subslab Vapor Sampling Manifold Schematic