



March 8, 2019

Mr. Ron Paananen  
HDR  
SR 520 Project Office  
999 Third Avenue, Suite 2200  
Seattle, WA 98104

RE: 2209 East Lake Washington Boulevard – Indoor Air Testing

Dear Mr. Paananen:

Shannon & Wilson performed indoor air testing at the 2209 East Lake Washington Boulevard property in Seattle, Washington (property) on behalf of the Washington State Department of Transportation (WSDOT).

The purpose of the testing was to evaluate indoor and ambient outdoor air at the WSDOT-owned property by collecting and analyzing two air samples. The air samples were analyzed for the presence of potentially hazardous chemicals, including gasoline-range petroleum hydrocarbons (gasoline) and associated benzene, toluene, ethylbenzene, and xylene (collectively known as BTEX). The property consists of two buildings, a residence and a garage. The garage is proposed to be used as a project office during the Montlake Phase of construction activities.

Soil and groundwater contamination, including gasoline and BTEX, have been identified at the Montlake Gas Station approximately 125 feet southwest of the nearest property building (the garage). Exhibit 1 shows the approximate location of soil and groundwater contamination with respect to the property. Since gasoline and BTEX readily partition from soil and groundwater into the vapor or gaseous phase, this creates the potential for migration of gasoline and BTEX as vapor through the subsurface. Chemicals vapors can potentially migrate from nearby soil and groundwater contamination into the indoor air of nearby or overlaying buildings. For this reason, we tested the indoor air of the property's garage.

Conclusions from the indoor air testing at the property's garage are:

- The indoor air sample contained concentrations of benzene and toluene above the ambient air concentrations, indicating a potential source within the building

(e.g., observed staining on the garage floors) or that vapor migration and intrusion is occurring.

- Gasoline, benzene, and toluene are likely present in ambient air because of nearby vehicular traffic and this is also likely the primary source of these chemicals within the garage.
- It is inconclusive whether nearby soil and groundwater contamination is contributing potentially hazardous chemicals to the indoor air of the garage.
- Mitigation measures could include sealing the subsurface wall, slab, and utility inlets into the garage.

## **BACKGROUND**

Phase I and Phase II environmental site assessments (ESAs) have been completed at the Montlake Gas Station, a site located southwest of the property and on the opposite side of Montlake Boulevard East (Exhibit 1). Subsurface explorations at the Montlake Gas Station site have found elevated concentrations of gasoline and BTEX in soil and groundwater. The approximate delineation of contaminated soil and groundwater at the Montlake Gas Station is based on laboratory analysis of soil and groundwater samples collected from subsurface explorations. Please note that the delineation of the contaminants at the Montlake Gas Station (Exhibit 1) may change based on additional subsurface explorations and testing. The property garage corner lies approximately 125 feet from the estimated edge of the contaminated soil and groundwater.

## **FIELD ACTIVITIES**

Field activities for the indoor air testing were conducted in general accordance with the Washington State Department of Ecology's (Ecology) Vapor Intrusion Guidance (Ecology, 2018). The indoor air sampling was completed in accordance with Section 3.2.1 Tier II indoor air sampling of the guidance. The Tier II indoor air sampling is typically conducted (1) if gasoline and BTEX are present in nearby soil and groundwater contamination and (2) if buildings are present within 100 feet of the gasoline and BTEX contamination. Since the property buildings are greater than 100 feet from the nearby approximated contamination (Exhibit 1), the buildings would not typically be considered locations of potential vapor intrusion issues. However, to be conservative, WSDOT elected to conduct air sampling to further ensure that vapor intrusion was not a hazard within the property buildings as heterogeneity in the subsurface (such as utility lines) can cause some uncertainty regarding the extent of

vapor migration. In addition, the western portion of the garage is approximately 4 to 5 feet below ground surface. This exposes the western portion of the garage to subsurface soils that may potentially contain hazardous vapors.

In advance of sampling, we conducted a property reconnaissance on February 8, 2019. During the reconnaissance, WSDOT identified:

- Property buildings
- The planned use for each building
- Relevant features that may impact air sampling results, such as septic lines; natural gas heater; heating, ventilation, and air conditioning system, etc.

Shannon & Wilson personnel further evaluated the property buildings and outdoor conditions to assess areas with increased potential for vapor intrusion occurrence such as cracks in subsurface building walls and foundations. Attachment A contains field observation notes made during the property reconnaissance. Following the property reconnaissance, potential gasoline and BTEX emitters were removed from the property buildings to prevent their emissions from adding to the indoor air measurement. This included the removal of numerous paint cans, adhesives, paint thinners, and other miscellaneous items. After discussion about the future use of the property buildings, we determined that the indoor air sample would be collected from the garage. The garage is closer to the Montlake Gas Station and is planned for more extensive use than the residential building during the next few years.

The garage was ventilated on February 13, 2019, one day prior to the sampling date. The garage doors were opened and a fan was placed such that indoor air was blown outdoors. The fan was also moved around indoors to vent corners and other hard-to-access areas, such as rafters and ceiling spaces, within the garage. Ventilation occurred for approximately one hour.

On February 14, 2019, indoor and ambient air samples were collected from the property using certified-clean SUMMA canisters equipped with pressure gauges and 8-hour flow regulators. The 8-hour flow regulators were utilized to collect a sample of gasoline and BTEX concentrations over an 8-hour period, which corresponds to the length of a standard working day. The indoor SUMMA canister was deployed in the southwest corner of the garage (Exhibit 1). It was elevated approximately 54 inches above the garage floor. The outdoor SUMMA canister was placed on the northwest corner of the garage roof (Exhibit 1). It was placed underneath a table for rain

protection and on top of a plastic base to keep it above the snow, at approximately 72 inches above the surrounding ground surface. Photographs of SUMMA canisters and sampling locations for the indoor and ambient air samples are included in Attachment A.

The 8-hour indoor and ambient air sampling began at 8:50 a.m. on February 14, 2019. The initial vacuum reading from the indoor air gauge was 26 inches of mercury (inches Hg). The initial vacuum reading from the outdoor air gauge was 30 inches Hg. The gauges and weather conditions were checked every two hours during the 8-hour sample collection period. The field notes and weather conditions, including hourly plots of temperature, barometric pressure, precipitation, and humidity, for the length of the air sampling event are included in Attachment A. Throughout the day, the pressure gauges indicated that the SUMMA canister vacuum pressures dropped linearly at approximately -3 inches Hg per hour as they were drawing air samples. At 4:30 p.m., final gauge readings were recorded prior to closing SUMMA sampling canister valves at 4:50 p.m. The final vacuum reading from the indoor air gauge was 4 inches Hg. The final vacuum reading from the ambient air gauge was 8 inches Hg.

The SUMMA canisters were transported and delivered to Fremont Analytical of Seattle, Washington. Samples were delivered at 5:15 p.m. and logged in to be analyzed for gasoline and BTEX using the U.S. Environmental Protection Agency (USEPA) TO-15 Method.

## **RESULTS**

The indoor and ambient air samples were analyzed for potentially hazardous chemicals, including gasoline and BTEX. BTEX was selected for laboratory analysis as these chemicals are commonly associated with gasoline contamination and/or are present in nearby soil and groundwater contamination. The laboratory analytical report is included as Attachment B. The results of indoor and ambient air samples have also been summarized and tabulated in Exhibit 2. As Ecology recommends (Ecology, 2018), the indoor air sampling results have been corrected in Exhibit 2, where applicable, by subtracting the ambient air result. This correction is applied to indoor air data so that natural background concentrations from the ambient condition are not evaluated as part of the indoor air measurement. Ambient air is affected near busy roadways where incomplete combustion from vehicular traffic may lead to detections of gasoline and/or BTEX in air samples. During air sample collection, the prevailing wind directions were from the northwest and north-northwest (Exhibit 1). This would place the adjacent four-way traffic intersection upwind of the ambient sampling location.

Since WSDOT intends to convert the garage into a working office space, the air sampling results have been compared to permissible exposure limits (PELs) and recommended exposure limits (RELs) provided by Occupational Safety and Health Administration and National Institute for Occupational Safety and Health, respectively. The results have also been compared to the more stringent Ecology Model Toxic Control Act (MTCA) Method B Indoor Air clean up level (CUL) (Table 1).

Measured concentrations of gasoline and BTEX from indoor and ambient air did not exceed the applicable PELs or RELs. Both the indoor and ambient air sample concentrations of benzene exceeded the MTCA Method B Indoor Air CUL. However, after correcting the indoor air benzene sample result, indoor benzene detections are mostly attributable to background ambient air concentrations, and thus, significant benzene is not anticipated to be sourced within the garage.

## **LIMITATIONS**

This letter report was prepared for the exclusive use of WSDOT and their representatives for indoor air evaluations conducted at the 2209 East Lake Washington Boulevard property. The results, conclusions, and recommendations contained in this letter are based on site conditions as they existed at the time of our sampling, and further assume that the sampling is representative of the current property conditions. Within the limitations of the scope, schedule, and budget, the results, conclusions, and recommendations presented in this letter were prepared in accordance with generally accepted professional environmental principles and practice in this area at the time this letter report was prepared. We make no other warranty, either expressed or implied. Our conclusions and recommendations are based on our understanding of the project as described in this letter report and the site conditions as interpreted from the sampling and testing.

Shannon & Wilson has prepared the enclosed Attachment C, "Important Information About Your Geotechnical/Environmental Report," to assist you and others in understanding the use and limitations of our reports.

Mr. Ron Paananen  
HDR  
March 8, 2019  
Page 6 of 6

We appreciate this opportunity to provide environmental services to you for this project. If you have questions regarding this letter, please contact the undersigned at (206) 632-8020.

Sincerely,

**SHANNON & WILSON, INC.**

Joseph Sawdey, LG  
Senior Geologist

Meg Strong, LHG  
Vice President

JXS:MJS/jxs

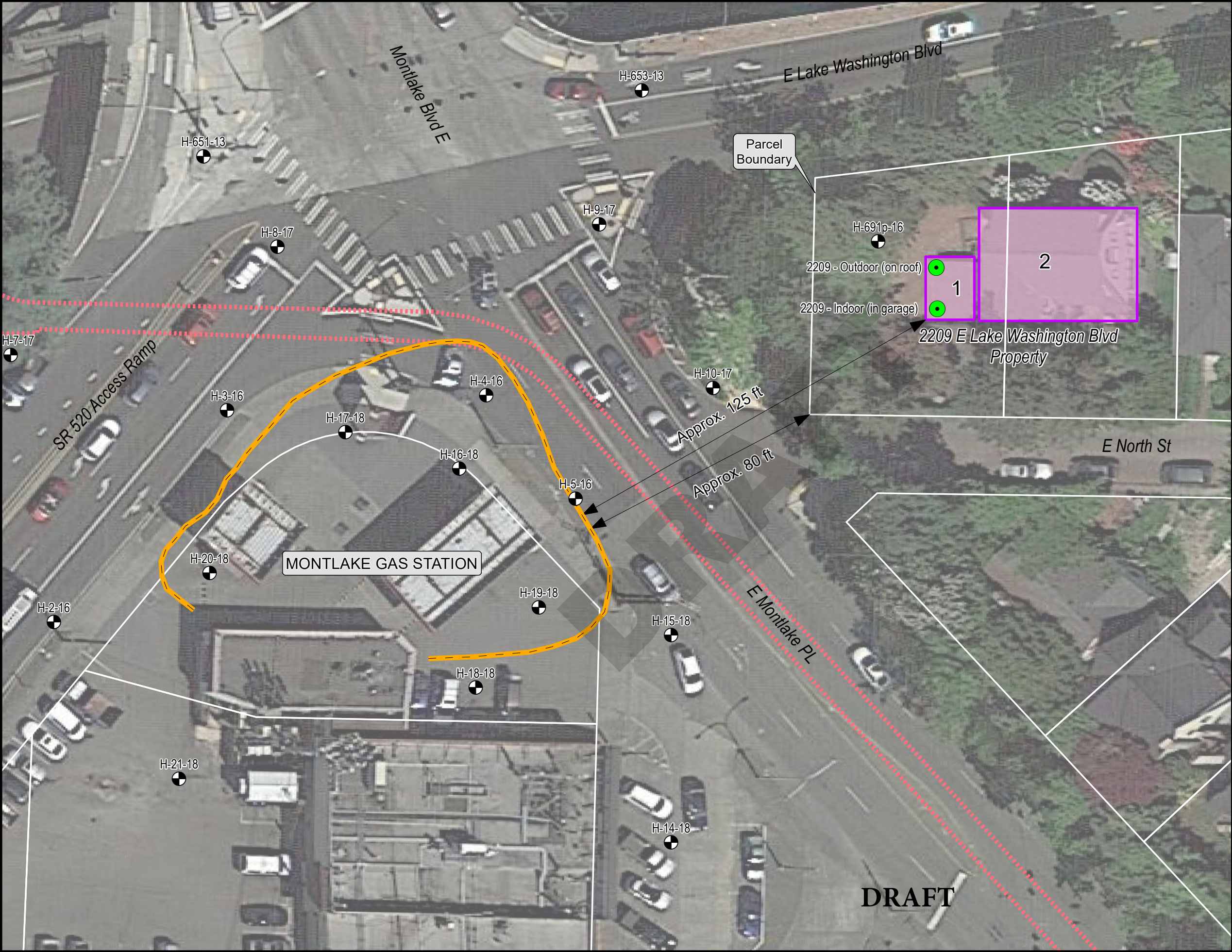
Enclosures   Exhibit 1 – 2209 Vapor Testing  
                  Exhibit 2 – Summary of Air Monitoring Results  
                  Attachment A – Field Documentation and Weather Conditions (12 pages)  
                  Attachment B – Laboratory Report #1902161 (10 pages)  
                  Attachment C – Important Information About Your  
                                  Geotechnical/Environmental Report

cc:   Steve Strand, PE

References

Washington State Department of Ecology (Ecology), 2018, Guidance for evaluating soil vapor intrusion in Washington State: investigation and remedial action (draft, rev. ed II.): Olympia, Wash., Washington State Department of Ecology, Publication no. 09-09-047, April 2018.





LEGEND

COMPLETED EXPLORATIONS



Existing Utility - Sewer Line  
(Approximate Footprint)



Contaminated Soil and Groundwater  
(Approximate)

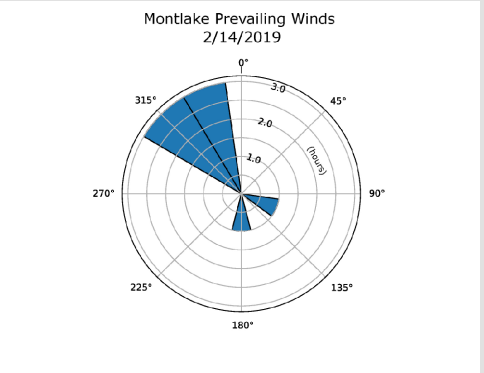


2209 VAPOR TESTING

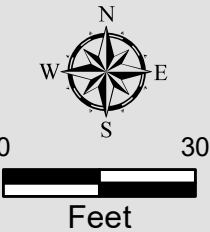
1 Property Garage

2 Property Residence

Air Sampling Locations



Source: University District Weather Station  
(KWASEATT109)



SR 520 Montlake to Lake Washington  
I/C and Bridge Replacement  
Seattle, Washington

2209 VAPOR TESTING

March 2019

21-1-22242-078

SHANNON & WILSON, INC.  
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

EXHIBIT 1



EXHIBIT 2  
SUMMARY OF AIR MONITORING RESULTS

2209 East Lake Washington Boulevard East  
Indoor Air Testing

Sample ID	Sample Location	Gasoline Range Organics (µg/m <sup>3</sup> )	Corrected Gasoline Range Organics (µg/m <sup>3</sup> )*	Benzene (µg/m <sup>3</sup> )	Corrected Benzene (µg/m <sup>3</sup> )*	Toluene (µg/m <sup>3</sup> )	Corrected Toluene (µg/m <sup>3</sup> )*	Ethylbenzene (µg/m <sup>3</sup> )	Total Xylenes (µg/m <sup>3</sup> )
2209-Outdoor	Background outside air	71.3	0	0.954	0	1.91	0	<1.74	<5.21
2209-Indoor	Indoor air (garage)	62.1	-9.2	1.09	0.136	2.10	0.19	<1.74	<5.21
MTCA Method B** Indoor Air CUL (µg/m <sup>3</sup> )		NA	NA	0.32	0.32	2,290	2,290	457	45.7
NIOSH REL - TWA exposure limit (µg/m <sup>3</sup> )		NA	NA	319	319	375,000	375,000	435,000	435,000
OSHA PEL - TWA exposure limit (µg/m <sup>3</sup> )		900,000	900,000	3,193	3,193	750,000	750,000	435,000	435,000

Notes:

\* Outdoor air benzene concentrations were subtracted from indoor concentrations in accordance with Washington State Department of Ecology's Guidance Evaluating Soil Vapor Intrusion in Washington State Revised April 2018.

\*\* Lowest criteria between cancer and noncancer indoor air cleanup levels presented

**Bold text** indicates an analyte that was detected above the laboratory reporting limit.

Conversions to/from ppm to/from µg/m<sup>3</sup> assume 25 deg C temperature and 1 atmosphere pressure

ID = identification

MTCA = Model Toxics Control Act

NIOSH = National Institute for Occupational Safety and Health

OSHA = Occupational Safety and Health Administration

REL = recommended exposure limit

PEL = permissible exposure limit

TWA = time weighted average

µg/m<sup>3</sup> = micrograms per cubic meter

< = analyte was not detected above the laboratory reporting limit.

NA = not applicable

CUL = cleanup level

Exceedance detected in sample

DRAFT



## Attachment A

### Field Documentation and Weather Conditions (12 pages)

DRAFT

Job No.: 21-1-22242-078

Site: SR520, Montlake Gas Station

Location: Seattle, WA

Staff: Joseph Sawdey

Date: 2/8/2019

## Indoor Air Table - Garage

Item	Observation	Other Notes Additional notes in field book
HVAC	Operating?  Can it be shut down?  Note General Locations	NA  - multiple vent/infil pipes on E. side
General Airflow	Noticeable drafts, where?  When doors open, general airflow direction?  Ventilation plan prior to sampling?	Both garage and office doors open, still pretty dead air  - If sampled here - bring fan to blow
Basement floor	Any cracks, gaps, holes, etc.?  Pipes or other conveyance penetrating floor?	Cracks, stains, holes in garage. Seals so in office area
Removable VOC containing sources	Household cleaners, solvents, paints, adhesives, etc.?  Note locations on map	Various, both office and garage
Furnace	Operating?  Can it be shut down?  What is fuel source and where is it stored?	✓. A
Septic tank	Where and if possible identify and septic lines	N. A.
Odors	Identifiable?  Intensity?	Slight odor (solvent) in garage

Job No.: 21-1-22242-078

Site: SR520, Montlake Gas Station

Location: Seattle, WA

Staff: Joseph Sawdey

Date: 2/8/2019

## Indoor Air Table - Res Basement

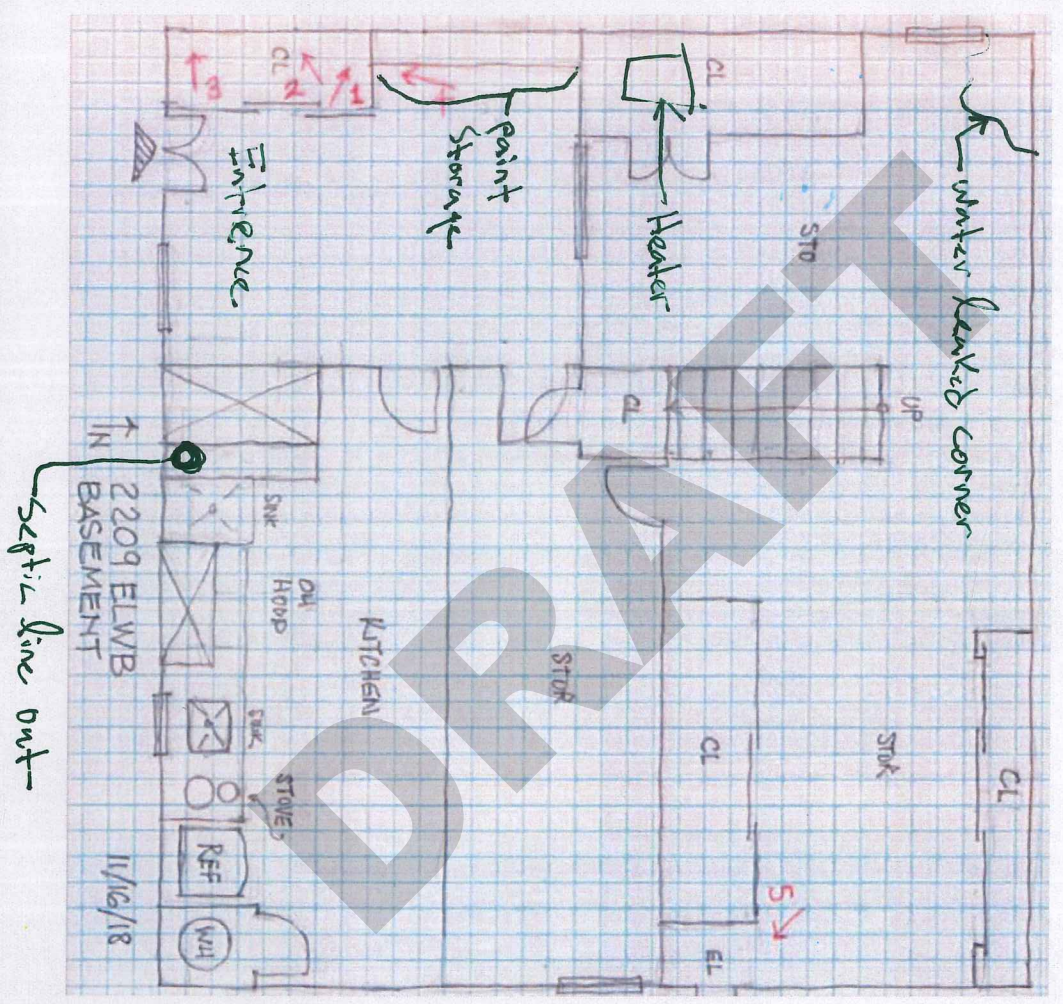
Item	Observation	Other Notes Additional notes in field book
HVAC	Operating? <i>No</i> Can it be shut down? <i>is shutdown</i> Note General Locations	<i>Steam from boiler and moving app around covering furnace</i>
General Airflow	Noticeable drafts, where? When doors open, general airflow direction? Ventilation plan prior to sampling?	<i>Very little to no airflow even w/ door open Remove paint cans in entry way room</i>
Basement floor	Any cracks, gaps, holes, etc.? Pipes or other conveyance penetrating floor?	<i>Entire basement carpeted or tiled, numerous wall cracks</i>
Removable VOC containing sources	Household cleaners, solvents, paints, adhesives, etc.? Note locations on map	<i>Paints</i>
Furnace	Operating? Can it be shut down? What is fuel source and where is it stored?	<i>N Y, is gas</i>
Septic tank	Where and if possible identify and septic lines	<i>Septic line runs from SW side building down into ground and out to tank?</i>
Odors	Identifiable? Intensity?	<i>None None</i>

Outdoor (Ambient Air) Table

Item	Observation	Other Notes Additional notes in field book
Wind direction	Predominant direction? E → W Nature (multiple directions?) —	→ weak transient gusts
Secure areas	Where? What makes them secure? Visibility? Trees, airflow obstruction notes	Property is fenced off. v. little public access low from public thoroughput
Elevated areas (2-3 meters ags)	Where? Approximate height ags?	multiple walls, fence roof access points ~1.5-2m
Odors	Identifiable? Source? Intensity?	Transient odd odor (exhaust from houses larger trucks) low intensity
Deployment notes	Additional equipment to aide in elevated canister deployment? Health and Safety concerns?	Chain and lock? use roof of warehouse and chain/lock to fence line



<b>RecordID</b>	<b>Baseline</b>	11/16/2018	<b>Floor</b>	Basement	<b>AddressCity</b>	Seattle	<b>Room Key</b>	K=Kitchen L=Library BR=Bedroom CL=Closet D=Den
118	<b>Second</b>		<b>AddressBuilding</b>	2209	<b>AddressState</b>	WA	BA=Bedroom G=Garage DK=Deck DR=Dining Room HA=Hallway O=Office	
	<b>Third</b>		<b>AddressStreet</b>	E Lake Wash. Blvd.	<b>AddressZip</b>	98112	LR=Living Room UT=Utility S=Storage FR=Family Room LAUND=Laundry	





Friday February 8<sup>th</sup> 2019 (1/3)

0920 Jxs meets Steve Strand onsite.

## Structure #1 - Garage

- ° planned office space
- ° high planned use - open to public
- ° not connected to the main building
  - no vent
  - no HVAC
  - Electrical = yes

° Low air flow even with garage door and side door open

° W. Side is ~ 4-5' bgs

° E. Side is at ground surface

° V. faint odor (solvent-like?) in garage

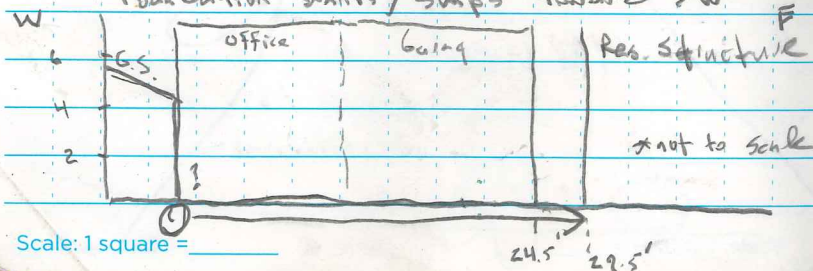
° Stains on garage floor

° Divided in two by wall

° Garage on the E / office on W

° Numerous paints, finishes, stain removers, enamels + cracks, holes

° Foundation slants / sumps toward SW



Scale: 1 square = 10'

24.5' 29.5'

Friday February 8<sup>th</sup> 2019 (2/3)

## Structure #2 Res Building

- ° planned for limited office space - Steve notes much less than garage building

° Heat and HVAC

° HVAC off

° Heater powered by nat. gas

° Water heater in kitchen area

° One entry from outside

° low air flow

° SW side is ground surface

° NE side is 3-4 bgs

° No odors

° No chem storage - paint found in entry

° Water leak in NW corner

° Steve thinks faucet (outdoor) leaked and caused water leak

° Cracks not visible on floor as must basement is carpeted

° Septic line comes down through kitchen area

° No odors

1030 Talk with Steve. He plans to remove all chemicals from buildings

1050 Offsite

Scale: 1 square = 10'

Rite in the Rain



10 Friday February 8<sup>th</sup> 2018 (1/3)

0920 Jxs meets Steve Stand onsite

### Structure #1 - Garage

- ° planned office space
- ° high planned use - open to public
- ° not connected to the main building

- no heat

- no HVAC

- Electrical = yes

- ° Low air flow even with garage door and side door open

- ° W. Side is ~ 4-5' bgs

- ° E. Side is at ground surface

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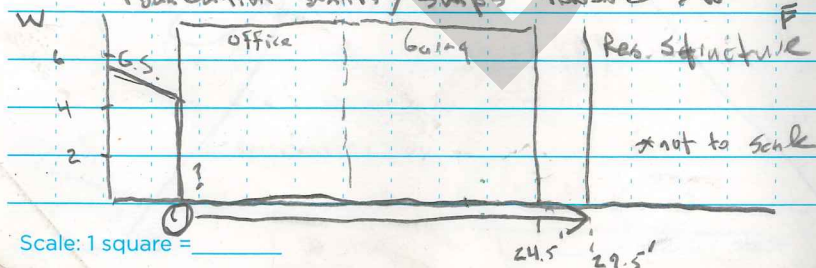
- ° Stains on garage floor

- ° Divided in two by wall

- ° Garage on the E / office on W

- ° Numerous paints, finishes, stain removers, chemicals + cracks, holes

- ° Foundation slants / sumps toward SW



Scale: 1 square =

Friday February 8<sup>th</sup> 2018 (2/3)

11

### Structure #2 Res Building

- ° planned for limited office space - Steve notes much less than garage building

- ° Heat and HVAC

- ° HVAC off

- ° Heater powered by nat. gas

- ° Water heater in kitchen area

- ° One entry from outside

- ° low air flow

- ° SW side is ground surface

- ° NE side is 3-4 bgs

- ° No odors

- ° No chemical storage - paint found in entry

- ° Water leak in NW corner

- ° Steve thinks faucet (outdoor) leaking and caused water leak

- ° Cracks not visible on floor as most basement is carpeted

- ° Septic line comes down through kitchen area

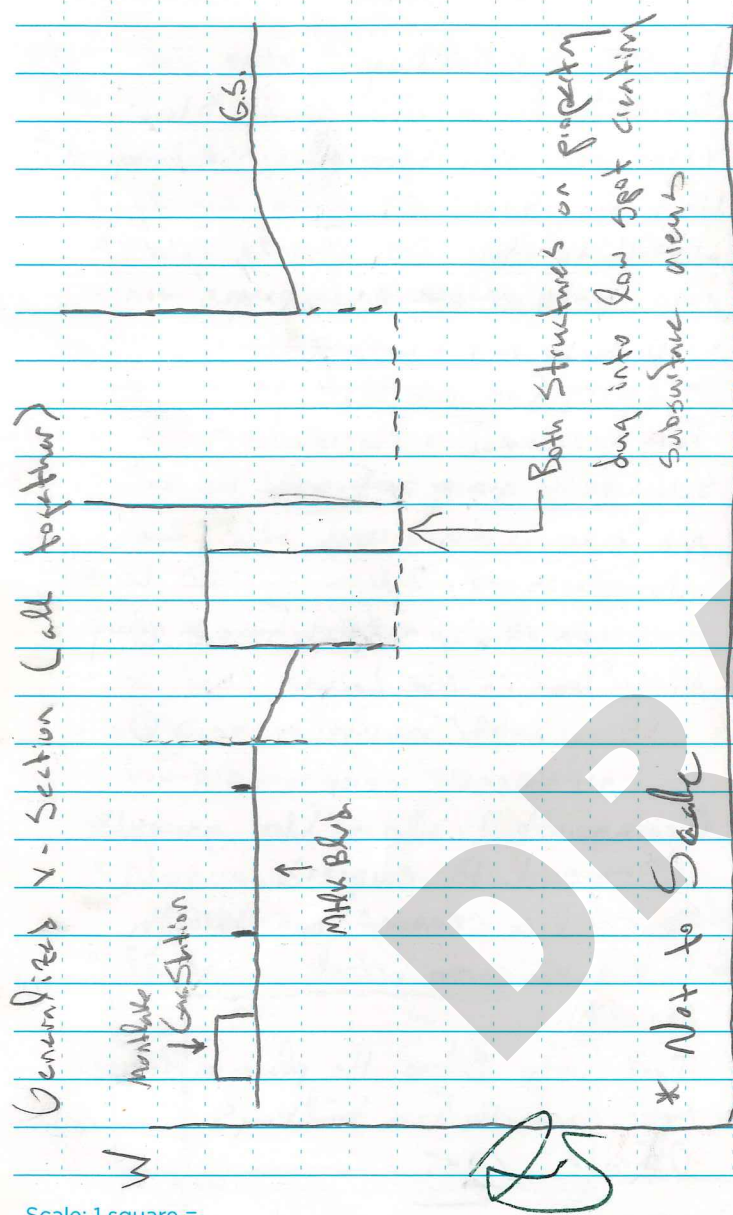
- ° No odors

1030 Talk with Steve. He plans to remove all chemicals from buildings

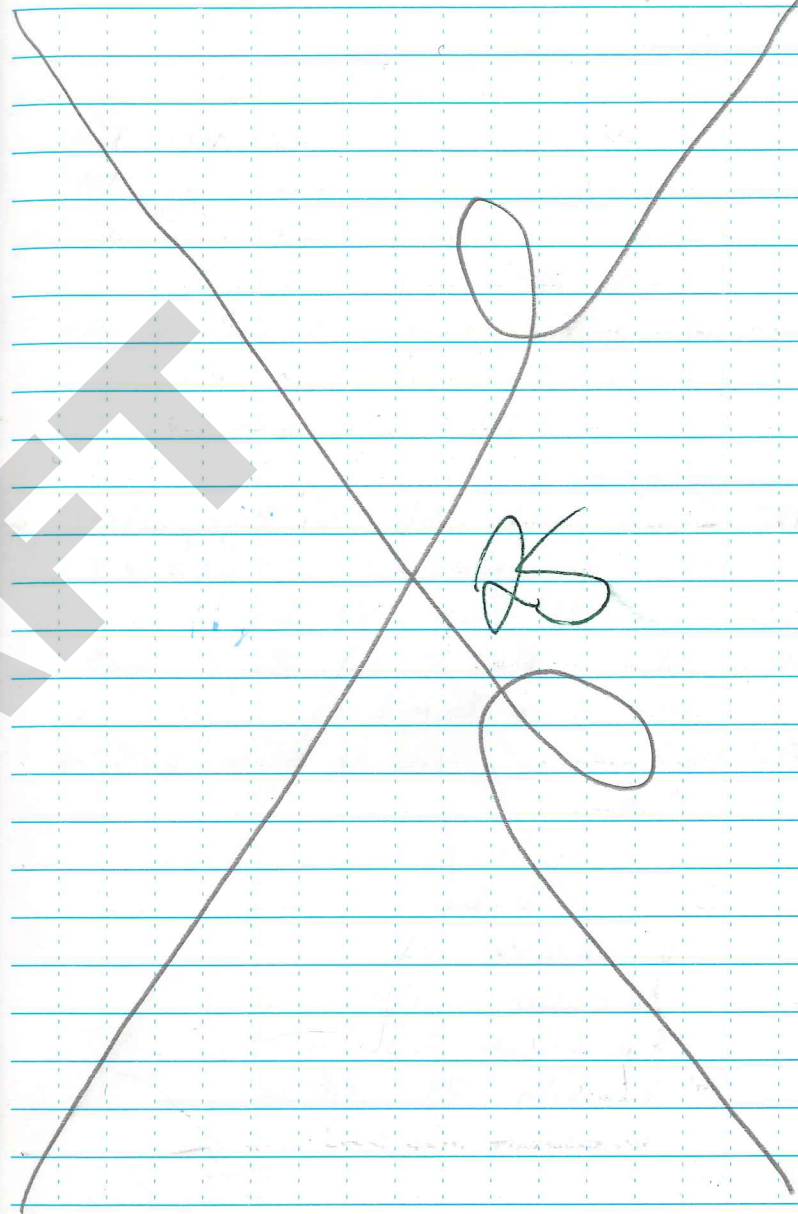
1050 Offsite

Scale: 1 square =

Rite in the Rain

Friday February 8<sup>th</sup> 2019

Scale: 1 square = \_\_\_\_\_



Scale: 1 square = \_\_\_\_\_

Rite in the Rain



14 Wednesday February 13<sup>th</sup> 2019

1350 Jxs onsite

1400 Gain access to site via old wood fence

1405 Begin venting garage space, open both bay doors and run fan on 'hi' setting facing outdoors

1420 Extend fan chord and walk through garage structure w/ fan, air ing out all corners and areas for headspace

1430 Resume stable venting on high setting with fan moving air out. Good air flow out Bay 1 in Bay 2

1450 Switch - Blow air out Bay 2, good air flow in Bay 1

1510 Done Venting, close up garage, pack up truck

Conditions @ departure:

Wind direction: NE

Wind speed: 3 mph

Baro pressure: 29.63" Hg

humidity: 73% relative

temperature: 39°F

Scale: 1 square = \_\_\_\_\_

15

Scale: 1 square = \_\_\_\_\_

*Rite in the Rain*



Ambient air sampling set up. SUMMA canister placed on top of a plastic base to keep it out of snow and underneath a table for rain protection. The SUMMA canister was placed on the northwest and upwind corner of the property garage.





Indoor air sampling set up. SUMMA canister elevated above the garage floor and placed within the southwest corner of the property garage.

Thursday 2/14/18

2209 - Indoor

0850: Tank = 26 inHg

Reg = 26 inHg

initial { Wind Direction: N 4 mph  
Pressure = 29.29 inHg  
Humidity = 67%  
Temp = 39°F

1058: Tank = 20 inHg

Reg = 20 inHg

1251: Tank = 14.5 inHg

Reg = 14.5 inHg

4 Hr { Wind = NW 6 mph  
Pressure = 29.14 inHg  
Humidity = 59%  
Temp = 44°F

1455: Tank = 7 inHg

Reg = 7 inHg

1630: Tank = 4 inHg

Reg = 4 inHg

end { Wind = NW 4 mph  
Pressure = 29.14 inHg  
Humidity = 84%  
Temp = 40°F

Scale: 1 square = \_\_\_\_\_

2209 - outdoor

0850: Tank = 30 inHg

Reg = 28 inHg

1058: Tank = 24 inHg

Reg = 23.5 inHg

2 Hr { Wind = NNW 6 mph  
Pressure = 29.2 inHg  
Humidity = 65%  
Temp = 42°F

1251: Tank = 18 inHg

Reg = 17 inHg

1455: Tank = 12 inHg

Reg = 11 inHg

6 Hr { Wind = NE 3 mph

Pressure = 29.12 inHg

Humidity = 70%

Temp = 42°F

1630: Tank = 8 inHg

Reg = 7 inHg

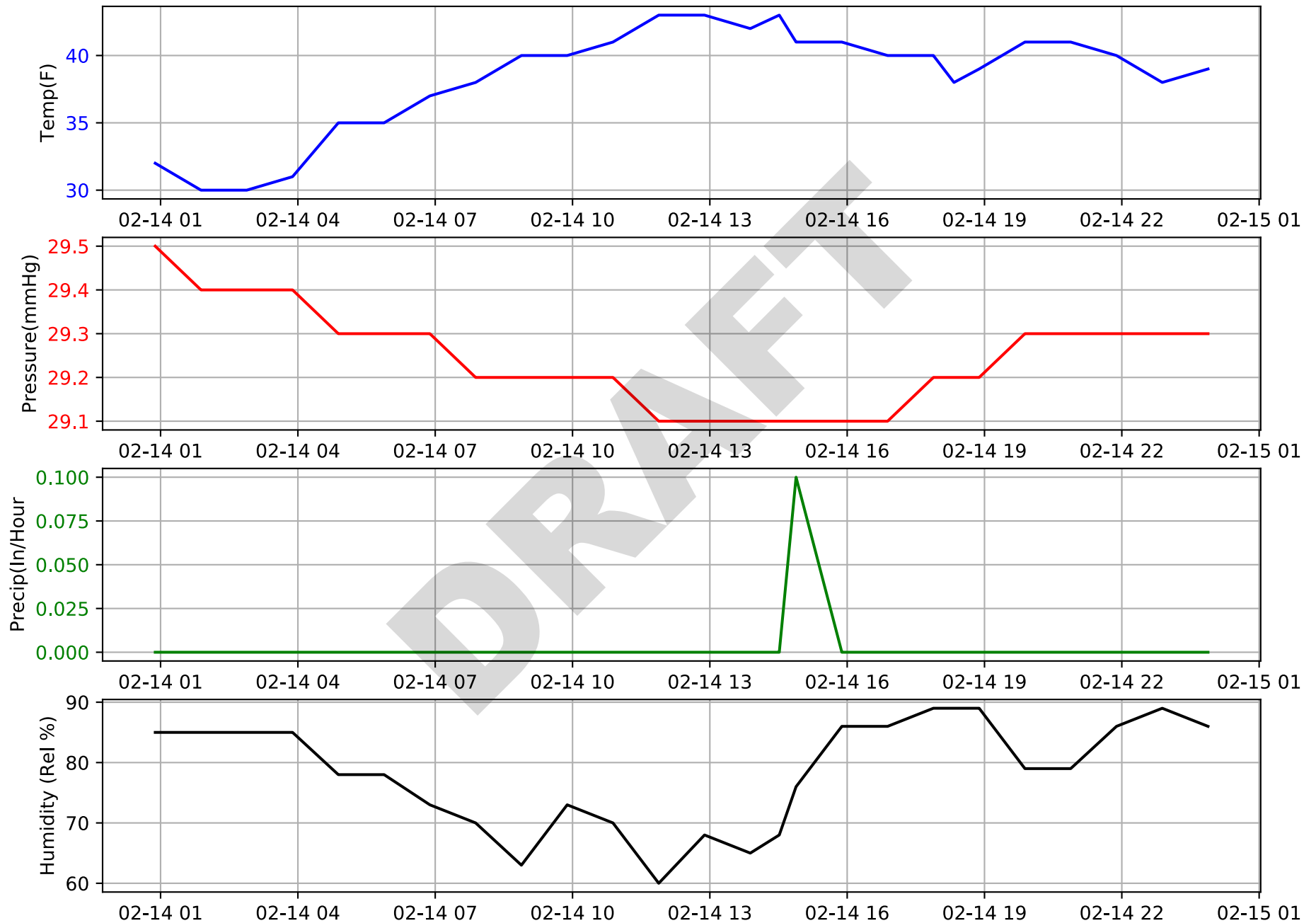
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*Rite in the Rain*



# Montlake Hourly Weather - 02/14/2019

Source: University District Weather Station (KWASEATT109)



## Attachment B

Laboratory Report #1902161 (10 pages)



**Fremont**  
*Analytical*

3600 Fremont Ave. N.  
Seattle, WA 98103  
T: (206) 352-3790  
F: (206) 352-7178  
info@fremontanalytical.com

**Shannon & Wilson**

Joseph Sawdey  
400 N. 34th Street, Suite 100  
Seattle, WA 98103

**RE: To LS Montlake DB**  
**Work Order Number: 1902161**

February 20, 2019

**Attention Joseph Sawdey:**

Fremont Analytical, Inc. received 2 sample(s) on 2/14/2019 for the analyses presented in the following report.

***Volatile Organic Compounds by EPA Method TO-15***

This report consists of the following:

- Case Narrative
- Analytical Results
- Applicable Quality Control Summary Reports
- Chain of Custody

All analyses were performed consistent with the Quality Assurance program of Fremont Analytical, Inc. Please contact the laboratory if you should have any questions about the results.

Thank you for using Fremont Analytical.

Sincerely,

Mike Ridgeway  
Laboratory Director

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**CLIENT:** Shannon & Wilson  
**Project:** To LS Montlake DB  
**Work Order:** 1902161

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**Work Order Sample Summary**

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Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
1902161-001	2209-Indoor	02/14/2019 8:50 AM	02/14/2019 5:15 PM
1902161-002	2209-Outdoor	02/14/2019 8:50 AM	02/14/2019 5:15 PM

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DRAFT



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**CLIENT:** Shannon & Wilson  
**Project:** To LS Montlake DB

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WorkOrder Narrative:

I. SAMPLE RECEIPT:

Samples receipt information is recorded on the attached Sample Receipt Checklist.

II. GENERAL REPORTING COMMENTS:

Air samples are reported in ppbv and ug/m3.

The validity of the analytical procedures for which data is reported in this analytical report is determined by the Laboratory Control Sample (LCS) and the Method Blank (MB). The LCS and the MB are processed with the samples to ensure method criteria are achieved throughout the entire analytical process.

III. ANALYSES AND EXCEPTIONS:

Exceptions associated with this report will be footnoted in the analytical results page(s) or the quality control summary page(s) and/or noted below.

Standard temperature and pressure assumes  $24.45 = (25^{\circ}\text{C and } 1 \text{ atm})$ .

Note: Gasoline Range Organics reported in ug/m3 should be considered an estimate. The estimated molecular weight of gasoline used in the equation = 100

DRAFT

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**Qualifiers:**

- \* - Flagged value is not within established control limits
- B - Analyte detected in the associated Method Blank
- D - Dilution was required
- E - Value above quantitation range
- H - Holding times for preparation or analysis exceeded
- I - Analyte with an internal standard that does not meet established acceptance criteria
- J - Analyte detected below Reporting Limit
- N - Tentatively Identified Compound (TIC)
- Q - Analyte with an initial or continuing calibration that does not meet established acceptance criteria (<20%RSD, <20% Drift or minimum RRF)
- S - Spike recovery outside accepted recovery limits
- ND - Not detected at the Reporting Limit
- R - High relative percent difference observed

**Acronyms:**

- %Rec - Percent Recovery
- CCB - Continued Calibration Blank
- CCV - Continued Calibration Verification
- DF - Dilution Factor
- HEM - Hexane Extractable Material
- ICV - Initial Calibration Verification
- LCS/LCSD - Laboratory Control Sample / Laboratory Control Sample Duplicate
- MB or MBLANK - Method Blank
- MDL - Method Detection Limit
- MS/MSD - Matrix Spike / Matrix Spike Duplicate
- PDS - Post Digestion Spike
- Ref Val - Reference Value
- RL - Reporting Limit
- RPD - Relative Percent Difference
- SD - Serial Dilution
- SGT - Silica Gel Treatment
- SPK - Spike
- Surr - Surrogate



**Client:** Shannon & Wilson

**WorkOrder:** 1902161

**Project:** To LS Montlake DB

**Client Sample ID:** 2209-Indoor

**Date Sampled:** 2/14/2019

**Lab ID:** 1902161-001A

**Date Received:** 2/14/2019

**Sample Type:** Summa Canister

Analyte	Concentration		Reporting Limit		Qual	Method	Date/Analyst	
<u>Volatile Organic Compounds by EPA Method TO-15</u>								
	(ppbv)	(ug/m³)	(ppbv)	(ug/m³)				
Benzene	0.340	1.09	0.0895	0.286		EPA-TO-15	02/16/2019	AD
Ethylbenzene	<0.400	<1.74	0.400	1.74		EPA-TO-15	02/16/2019	AD
Gasoline Range Organics	15.2	62.1	1.00	4.09		EPA-TO-15	02/16/2019	AD
m,p-Xylene	<0.800	<3.47	0.800	3.47		EPA-TO-15	02/16/2019	AD
o-Xylene	<0.400	<1.74	0.400	1.74		EPA-TO-15	02/16/2019	AD
Toluene	0.557	2.10	0.400	1.51		EPA-TO-15	02/16/2019	AD
Surr: 4-Bromofluorobenzene	92.1 %Rec	--	70-130	--		EPA-TO-15	02/16/2019	AD



**Client:** Shannon & Wilson

**WorkOrder:** 1902161

**Project:** To LS Montlake DB

**Client Sample ID:** 2209-Outdoor

**Date Sampled:** 2/14/2019

**Lab ID:** 1902161-002A

**Date Received:** 2/14/2019

**Sample Type:** Summa Canister

Analyte	Concentration		Reporting Limit		Qual	Method	Date/Analyst	
<u>Volatile Organic Compounds by EPA Method TO-15</u>								
	(ppbv)	(ug/m³)	(ppbv)	(ug/m³)				
Benzene	0.299	0.954	0.0895	0.286		EPA-TO-15	02/16/2019	AD
Ethylbenzene	<0.400	<1.74	0.400	1.74		EPA-TO-15	02/16/2019	AD
Gasoline Range Organics	17.4	71.3	1.00	4.09		EPA-TO-15	02/16/2019	AD
m,p-Xylene	<0.800	<3.47	0.800	3.47		EPA-TO-15	02/16/2019	AD
o-Xylene	<0.400	<1.74	0.400	1.74		EPA-TO-15	02/16/2019	AD
Toluene	0.508	1.91	0.400	1.51		EPA-TO-15	02/16/2019	AD
Surr: 4-Bromofluorobenzene	84.5 %Rec	--	70-130	--		EPA-TO-15	02/16/2019	AD

**Work Order:** 1902161  
**CLIENT:** Shannon & Wilson  
**Project:** To LS Montlake DB

## QC SUMMARY REPORT

### Volatile Organic Compounds by EPA Method TO-15

Sample ID	LCS-R49533	SampType:	LCS	Units:	ppbv	Prep Date:	2/15/2019	RunNo:	49533		
Client ID:	LCSW	Batch ID:	R49533			Analysis Date:	2/15/2019	SeqNo:	970949		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual

Gasoline Range Organics	82.1	1.00	72.00	0	114	70	130				
Benzene	1.70	0.0895	2.000	0	85.0	70	130				
Toluene	1.61	0.400	2.000	0	80.3	70	130				
Ethylbenzene	1.69	0.400	2.000	0	84.4	70	130				
m,p-Xylene	3.19	0.800	4.000	0	79.8	70	130				
o-Xylene	1.55	0.400	2.000	0	77.4	70	130				
Surr: 4-Bromofluorobenzene	3.76		4.000		94.1	70	130				

Sample ID	MB-R49533	SampType:	MBLK	Units:	ppbv	Prep Date:	2/15/2019	RunNo:	49533		
Client ID:	MBLKW	Batch ID:	R49533			Analysis Date:	2/15/2019	SeqNo:	970989		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual

Gasoline Range Organics	ND	1.00									
Benzene	ND	0.0895									
Toluene	ND	0.400									
Ethylbenzene	ND	0.400									
m,p-Xylene	ND	0.800									
o-Xylene	ND	0.400									
Surr: 4-Bromofluorobenzene	3.24		4.000		81.0	70	130				

Sample ID	1902160-001AREP	SampType:	REP	Units:	ppbv	Prep Date:	2/15/2019	RunNo:	49533		
Client ID:	BATCH	Batch ID:	R49533			Analysis Date:	2/15/2019	SeqNo:	970953		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual

Gasoline Range Organics	1,500	1.00						1,561	3.99	30	I
Benzene	18.8	0.0895						18.31	2.73	30	
Toluene	13.0	0.400						12.83	1.21	30	
Ethylbenzene	3.56	0.400						3.364	5.79	30	I
m,p-Xylene	3.39	0.800						3.356	1.06	30	I
o-Xylene	1.25	0.400						1.228	1.98	30	I

**Work Order:** 1902161  
**CLIENT:** Shannon & Wilson  
**Project:** To LS Montlake DB

## QC SUMMARY REPORT

### Volatile Organic Compounds by EPA Method TO-15

Sample ID	1902160-001AREP	SampType:	REP	Units:	ppbv	Prep Date:	2/15/2019	RunNo:	49533		
Client ID:	BATCH	Batch ID:	R49533			Analysis Date:	2/15/2019	SeqNo:	970953		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Surr: 4-Bromofluorobenzene	4.17		4.000		104	70	130		0		I

#### NOTES:

I - Indicates an analyte with an internal standard that does not meet established acceptance criteria. A replicate analysis was performed and recovered the internal standard within range.  
 RPD meets acceptance criteria.

Client Name: **SW**  
 Logged by: **Brianna Barnes**

Work Order Number: **1902161**  
 Date Received: **2/14/2019 5:15:00 PM**

## Chain of Custody

1. Is Chain of Custody complete? Yes ☒ No ☐ Not Present ☐  
 2. How was the sample delivered? Client

## Log In

3. Coolers are present? Yes ☐ No ☒ NA ☐  
Air samples.  
 4. Shipping container/cooler in good condition? Yes ☒ No ☐  
 5. Custody Seals present on shipping container/cooler?  
 (Refer to comments for Custody Seals not intact) Yes ☐ No ☐ Not Required ☒  
 6. Was an attempt made to cool the samples? Yes ☐ No ☐ NA ☒  
 7. Were all items received at a temperature of >0°C to 10.0°C \* Yes ☐ No ☐ NA ☒  
 8. Sample(s) in proper container(s)? Yes ☒ No ☐  
 9. Sufficient sample volume for indicated test(s)? Yes ☒ No ☐  
 10. Are samples properly preserved? Yes ☒ No ☐  
 11. Was preservative added to bottles? Yes ☐ No ☒ NA ☐  
 12. Is there headspace in the VOA vials? Yes ☐ No ☐ NA ☒  
 13. Did all samples containers arrive in good condition(unbroken)? Yes ☒ No ☐  
 14. Does paperwork match bottle labels? Yes ☒ No ☐  
 15. Are matrices correctly identified on Chain of Custody? Yes ☒ No ☐  
 16. Is it clear what analyses were requested? Yes ☒ No ☐  
 17. Were all holding times able to be met? Yes ☒ No ☐

## Special Handling (if applicable)

18. Was client notified of all discrepancies with this order? Yes ☐ No ☐ NA ☒

Person Notified:  Date   
 By Whom:  Via: ☐ eMail ☐ Phone ☐ Fax ☐ In Person  
 Regarding:   
 Client Instructions:

19. Additional remarks:

## Item Information

\* Note: DoD/ELAP and TNI require items to be received at 4°C +/- 2°C





## Attachment C

# Important Information About Your Geotechnical/Environmental Report

DRAFT



Date:	March 8, 2019
To:	Mr. Ron Paananen
	HDR

## **IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL/ ENVIRONMENTAL REPORT**

### **CONSULTING SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND FOR SPECIFIC CLIENTS.**

Consultants prepare reports to meet the specific needs of specific individuals. A report prepared for a civil engineer may not be adequate for a construction contractor or even another civil engineer. Unless indicated otherwise, your consultant prepared your report expressly for you and expressly for the purposes you indicated. No one other than you should apply this report for its intended purpose without first conferring with the consultant. No party should apply this report for any purpose other than that originally contemplated without first conferring with the consultant.

### **THE CONSULTANT'S REPORT IS BASED ON PROJECT-SPECIFIC FACTORS.**

A geotechnical/environmental report is based on a subsurface exploration plan designed to consider a unique set of project-specific factors. Depending on the project, these may include: the general nature of the structure and property involved; its size and configuration; its historical use and practice; the location of the structure on the site and its orientation; other improvements such as access roads, parking lots, and underground utilities; and the additional risk created by scope-of-service limitations imposed by the client. To help avoid costly problems, ask the consultant to evaluate how any factors that change subsequent to the date of the report may affect the recommendations. Unless your consultant indicates otherwise, your report should not be used: (1) when the nature of the proposed project is changed (for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an unrefrigerated one, or chemicals are discovered on or near the site); (2) when the size, elevation, or configuration of the proposed project is altered; (3) when the location or orientation of the proposed project is modified; (4) when there is a change of ownership; or (5) for application to an adjacent site. Consultants cannot accept responsibility for problems that may occur if they are not consulted after factors which were considered in the development of the report have changed.

### **SUBSURFACE CONDITIONS CAN CHANGE.**

Subsurface conditions may be affected as a result of natural processes or human activity. Because a geotechnical/environmental report is based on conditions that existed at the time of subsurface exploration, construction decisions should not be based on a report whose adequacy may have been affected by time. Ask the consultant to advise if additional tests are desirable before construction starts; for example, groundwater conditions commonly vary seasonally.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes, or groundwater fluctuations may also affect subsurface conditions and, thus, the continuing adequacy of a geotechnical/environmental report. The consultant should be kept apprised of any such events, and should be consulted to determine if additional tests are necessary.

### **MOST RECOMMENDATIONS ARE PROFESSIONAL JUDGMENTS.**

Site exploration and testing identifies actual surface and subsurface conditions only at those points where samples are taken. The data were extrapolated by your consultant, who then applied judgment to render an opinion about overall subsurface conditions. The actual interface between materials may be far more gradual or abrupt than your report indicates. Actual conditions in areas not sampled may differ from those predicted in your report. While nothing can be done to prevent such situations, you and your consultant can work together to help reduce their impacts. Retaining your consultant to observe subsurface construction operations can be particularly beneficial in this respect.

## **A REPORT'S CONCLUSIONS ARE PRELIMINARY.**

The conclusions contained in your consultant's report are preliminary because they must be based on the assumption that conditions revealed through selective exploratory sampling are indicative of actual conditions throughout a site. Actual subsurface conditions can be discerned only during earthwork; therefore, you should retain your consultant to observe actual conditions and to provide conclusions. Only the consultant who prepared the report is fully familiar with the background information needed to determine whether or not the report's recommendations based on those conclusions are valid and whether or not the contractor is abiding by applicable recommendations. The consultant who developed your report cannot assume responsibility or liability for the adequacy of the report's recommendations if another party is retained to observe construction.

## **THE CONSULTANT'S REPORT IS SUBJECT TO MISINTERPRETATION.**

Costly problems can occur when other design professionals develop their plans based on misinterpretation of a geotechnical/environmental report. To help avoid these problems, the consultant should be retained to work with other project design professionals to explain relevant geotechnical, geological, hydrogeological, and environmental findings, and to review the adequacy of their plans and specifications relative to these issues.

## **BORING LOGS AND/OR MONITORING WELL DATA SHOULD NOT BE SEPARATED FROM THE REPORT.**

Final boring logs developed by the consultant are based upon interpretation of field logs (assembled by site personnel), field test results, and laboratory and/or office evaluation of field samples and data. Only final boring logs and data are customarily included in geotechnical/environmental reports. These final logs should not, under any circumstances, be redrawn for inclusion in architectural or other design drawings, because drafters may commit errors or omissions in the transfer process.

To reduce the likelihood of boring log or monitoring well misinterpretation, contractors should be given ready access to the complete geotechnical engineering/environmental report prepared or authorized for their use. If access is provided only to the report prepared for you, you should advise contractors of the report's limitations, assuming that a contractor was not one of the specific persons for whom the report was prepared, and that developing construction cost estimates was not one of the specific purposes for which it was prepared. While a contractor may gain important knowledge from a report prepared for another party, the contractor should discuss the report with your consultant and perform the additional or alternative work believed necessary to obtain the data specifically appropriate for construction cost estimating purposes. Some clients hold the mistaken impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing the best available information to contractors helps prevent costly construction problems and the adversarial attitudes that aggravate them to a disproportionate scale.

## **READ RESPONSIBILITY CLAUSES CLOSELY.**

Because geotechnical/environmental engineering is based extensively on judgment and opinion, it is far less exact than other design disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. To help prevent this problem, consultants have developed a number of clauses for use in their contracts, reports, and other documents. These responsibility clauses are not exculpatory clauses designed to transfer the consultant's liabilities to other parties; rather, they are definitive clauses that identify where the consultant's responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your report, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to your questions.

The preceding paragraphs are based on information provided by the  
ASFE/Association of Engineering Firms Practicing in the Geosciences, Silver Spring, Maryland