CALIBRE

Memorandum

To: Sunny Becker, Washington State Department of Ecology
Copies: Bob Code & Glen Dodge, Cascade Columbia, Tom Colligan, Floyd-Snider
From: Tom McKeon, CALIBRE
Date: May 28, 2014
Project: Fox Avenue Site

Re: Technical Memorandum, Remedial Optimization of the Fox Avenue Site 2013 – Second Half

This Technical Memorandum summarizes field activities conducted during the second half of 2013 at the Fox Avenue Site (monitoring in August through October 2013 and related ongoing remediation actions). This memo focuses on one element of the Site-wide Remedial Actions (RA); biological treatment of groundwater using Enhanced Reductive Dechlorination (ERD).

Field activities completed in this period included:

1. Site-wide substrate injections to promote ERD;
2. Expansion of the ERD injection well (IW) network in the loading dock area (two new IWs installed in October 2013);
3. Well development, baseline sampling, substrate injection and bio-augmentation for these two new IWs;
4. Post-thermal treatment temperature monitoring along Fox Avenue.

A prior Performance Monitoring and Remedial Optimization report (CALIBRE 2013) describes all performance monitoring data and field activities at the Site in the first half of 2013 (through July 2013, and related to the ERD treatment). During this prior period, four injection wells were installed, developed, and sampled on Seattle Boiler Works property. Several rounds of performance data were collected during this timeframe. Results of these monitoring events (1st half of 2013) showed a number of wells at or approaching remediation levels (250 ug/L for total chlorinated volatile organic compounds -CVOCs). Additionally, several down-gradient monitoring wells near the point-of-compliance indicated CVOC concentrations below the Site cleanup goals (set in the Cleanup Action Plan). The four seeps in the Myrtle St. embayment were also sampled; results showed CVOC levels at three of the four seeps were below the Site cleanup goals. The CVOC concentrations from the last seep were above cleanup goals (at seep SP-03) but indicated significant reductions (97% reduction). All of these data are reported in the 1st half 2013 report.

In the second half of 2013 a site-wide substrate injection event was completed on 26 August 2013 – 12 September 2013. A total of 29 wells, including seven wells in the NW corner area, eleven Row 1 wells along Fox Avenue, and eleven Row 2 wells were injected over depth during this event. Table 1 provides a summary of volumes and total mass of substrate injected at each injection well during this 2013 event.

Sampling completed in August 2013, as part of the post-thermal monitoring, showed residual CVOC contamination in the loading dock area of the Fox Avenue site (total CVOCs at 2,660 ug/L; 10-14 ft bgs).

Two shallow level injection wells (R1-IW16 and R1-IW21) were installed at this location in October 2013 as bio-polish ERD treatment wells. The locations of these new injection wells are shown in Figure 1. The injection wells were registered in the Ecology UIC program. These wells were developed using a surge and pump technique. Following well development, the new wells were sampled for CVOCs. The results showed detectable levels of CVOCs (PCE, TCE, DCE, and VC). Well R1-IW21 had a PCE concentration of 1,320 ug/L (total CVOCs at 2,361 ug/L) and well R1-IW16 had a PCE concentration of 700 ug/L (total CVOCs at 1,363 ug/L). Table 2 presents the analytical results from these two samples, including the groundwater temperature measured at the time of sampling (R1-IW16 = 23.5 °C and R1-IW21 = 25.6°C). All sampling data have been uploaded to Ecology's EIM database. ERD treatment was started in this area in October 2014; each well was injected with 750 gal of sucrose substrate. Approximately 250 gallons of chase water mixed with buffer agent (~2,150 ppm alkalinity as carbonate) were injected into each well after the substrate solution was injected. After substrate injections were complete (one week later), bio-augmentation was implemented in the new injection wells. The microbe source for bio-augmentation was from the groundwater pumped from existing well R1-IW7. Bacterial census data collected previously (CALIBRE 2013) showed abundant dechlorinating bacteria present in the groundwater at this well. The October 2013 sampling results, well logs, and UIC registration for the two new injection wells are presented in Attachment A.

Groundwater temperatures were monitored in selected wells along Fox Ave as part of the post-thermal monitoring in August, September, and October of 2013. The temperature data are presented as cross sections in Figures 2 through 7. Elevated temperatures were recorded from wells just north of the loading dock area (R1-IW15) south to well R1-IW7, with temperatures ranging from 18.4 to 50+ °C. The central portion of the plume (wells R1-IW2 to R1-IW6) remained above 30 °C throughout this monitoring period to a depth of about 40 ft bgs. By October 2013 temperatures at selected wells on the periphery of this heated zone appeared to be cooling (back towards the ambient temperature of approximately ~14 °C). The sequence of cross-section data plots present a clear picture of the heat plume migrating across the monitoring transect. Temperature monitoring from wells along the west side of Fox Avenue showed elevated temperatures primarily in the 1st WBZ with heating of the 2nd WBZ to a depth of about 25 to 30 ft bgs.

References

CALIBRE. 2013. *Enhanced Reductive Dechlorination - Performance Monitoring and Remedial Optimization Report: First Half 2013.* Prepared for Fox Avenue Building LLC. 16 September 2013.

Tables

Table 1

Substrate Injection Mass

Fox Avenue Site

Aug-13, Sept-13, Oct-13.		
Well ID	**Substrate Volume (gallons)**	**Substrate Mass (lbs sugar)**
R1-IW2	3,203	1,970
R1-IW3A	1,000	340
R1-IW3B	1,489	507
R1-IW4A	1,000	340
R1-IW4B	1,517	516
R1-IW5	2,273	1,510
R1-IW6	2,571	1,712
R1-IW7	2,467	1,634
R1-IW8	754	576
R1-IW9	752	574
R1-IW10	751	573
R1-IW11	750	510
R1-IW12	750	367
R1-IW13	750	326
R1-IW14	750	331
R1-IW15	2,250	1,448
R1-IW16*	750	685
R1-IW17	2,321	1,189
R1-IW18	2,374	1,204
R1-IW19	2,306	1,136
R1-IW20	2,271	1,229
R1-IW21*	750	685
R2-IW1	2,604	1,215
R2-IW2	2,595	1,203
R2-IW3	2,500	1,109
R2-IW4	2,560	1,197
R2-IW5	2,518	1,175
R2-IW6	2,630	1,245
R2-IW7	920	382
R2-IW8	2,478	1,122
R2-IW9	2,503	1,133
R2-IW10	1,600	1,075
R2-IW11	1,600	1,075
Total	**58,307**	**31,295**
Abbreviations:		
lbs Pounds		

*Loading Dock Wells R1-IW16 and R1-IW21 were installed and injected October 2013.

Table 2
R1-IW16 & R1-IW21 Water Quality CVOC Data (Row 1 Injection Wells-Loading Dock, 1st WBZ)

Sample Date	PCE (µg/L)	TCE (µg/L)	cis-1,2-DCE (µg/L)	trans-1,2-DCE (µg/L)	VC (µg/L)	Total CVOCs (µg/L)	GW Temperature (°C)
R1-IW16-12							
10/18/2013	700 D	188 D	433 D	14.6	26.9	1,363	23.5
R1-IW21-12							
10/18/2013	1,320 D	264 D	690 D	45.6	41.2	2,361	25.6

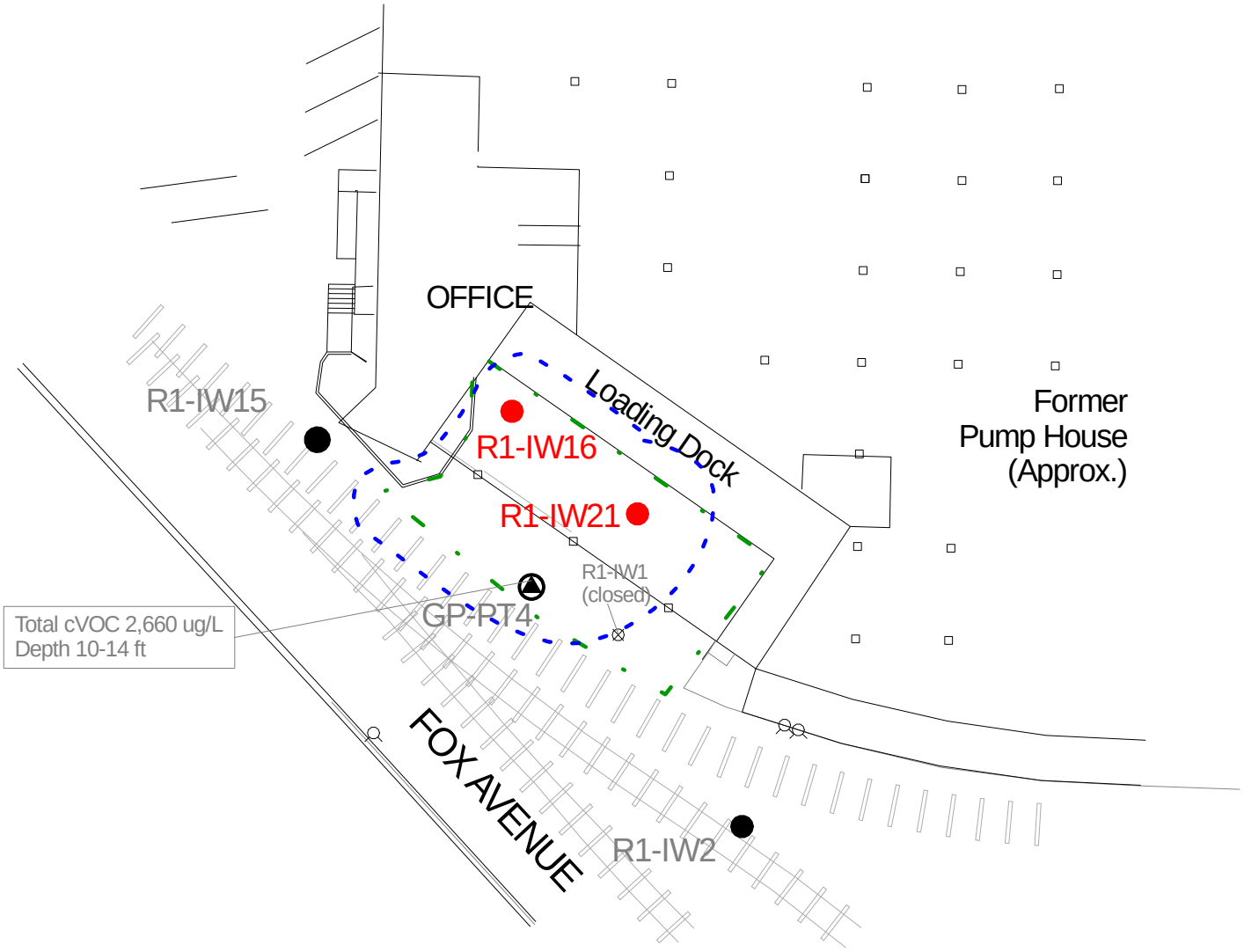
Abbreviations:

CVOC Chlorinated volatile organic compound
DCE Dichloroethene
PCE Tetrachloroethene
TCE Trichloroethene
VC Vinyl chloride

Qualifiers:

U Non-detect
J Estimated
E Estimated concentration exceeded calibration range
D Dilution was required

Figures



New Shallow Zone Injection Wells (15 ft)

Existing Injection Well

Probe groundwater sample

Pre-thermal > 1ppm ISO contour

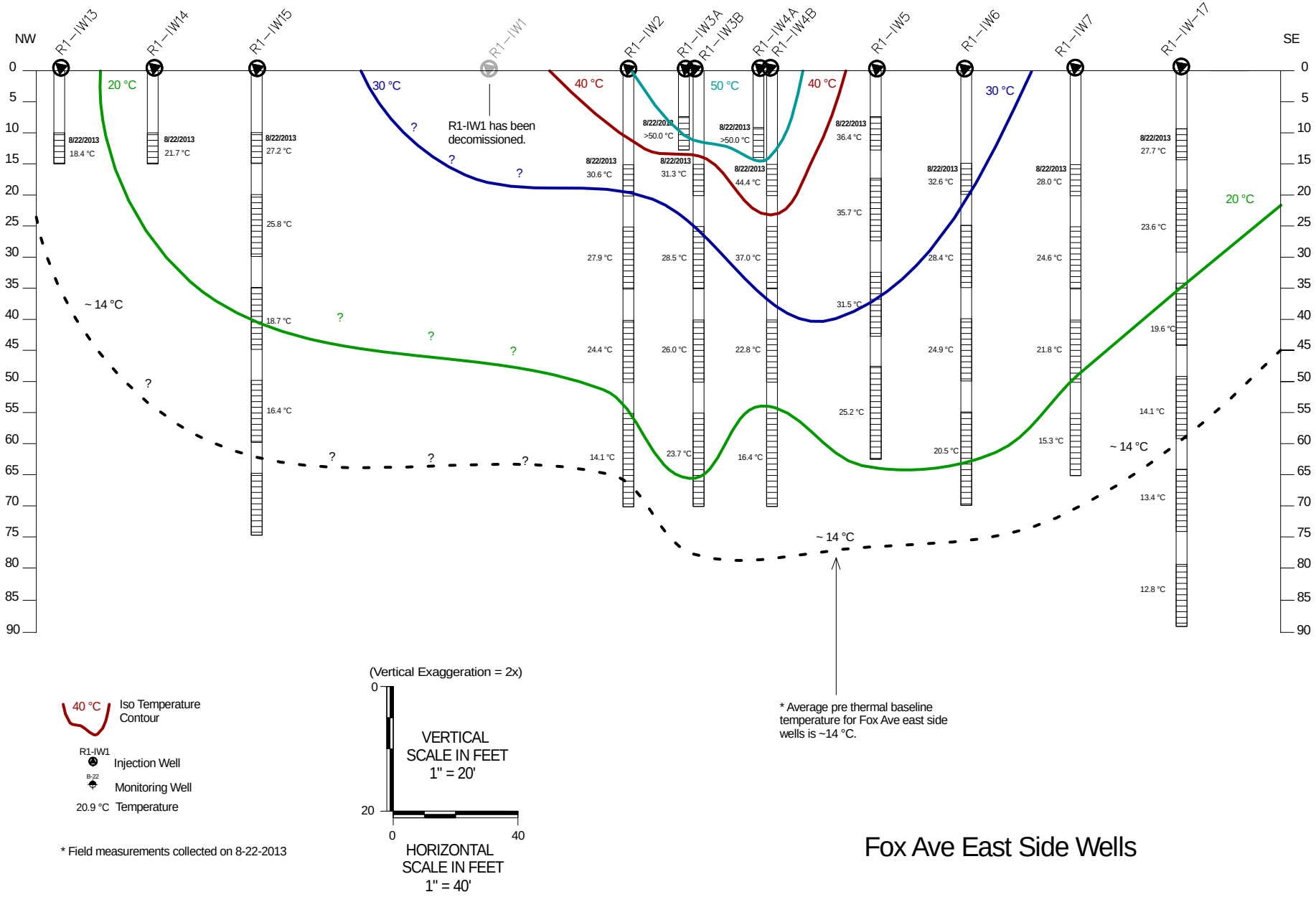
Thermal Treatment Areas

N

0 15' 30' 60'

SCALE IN FEET

CALIBRE Our Success Follows Yours	Plan View Fox Avenue Site Seattle, WA	Figure 1 Location of Shallow Zone ERD Injection Wells Loading Dock Area Fox Ave Site



Fox Ave East Side Wells

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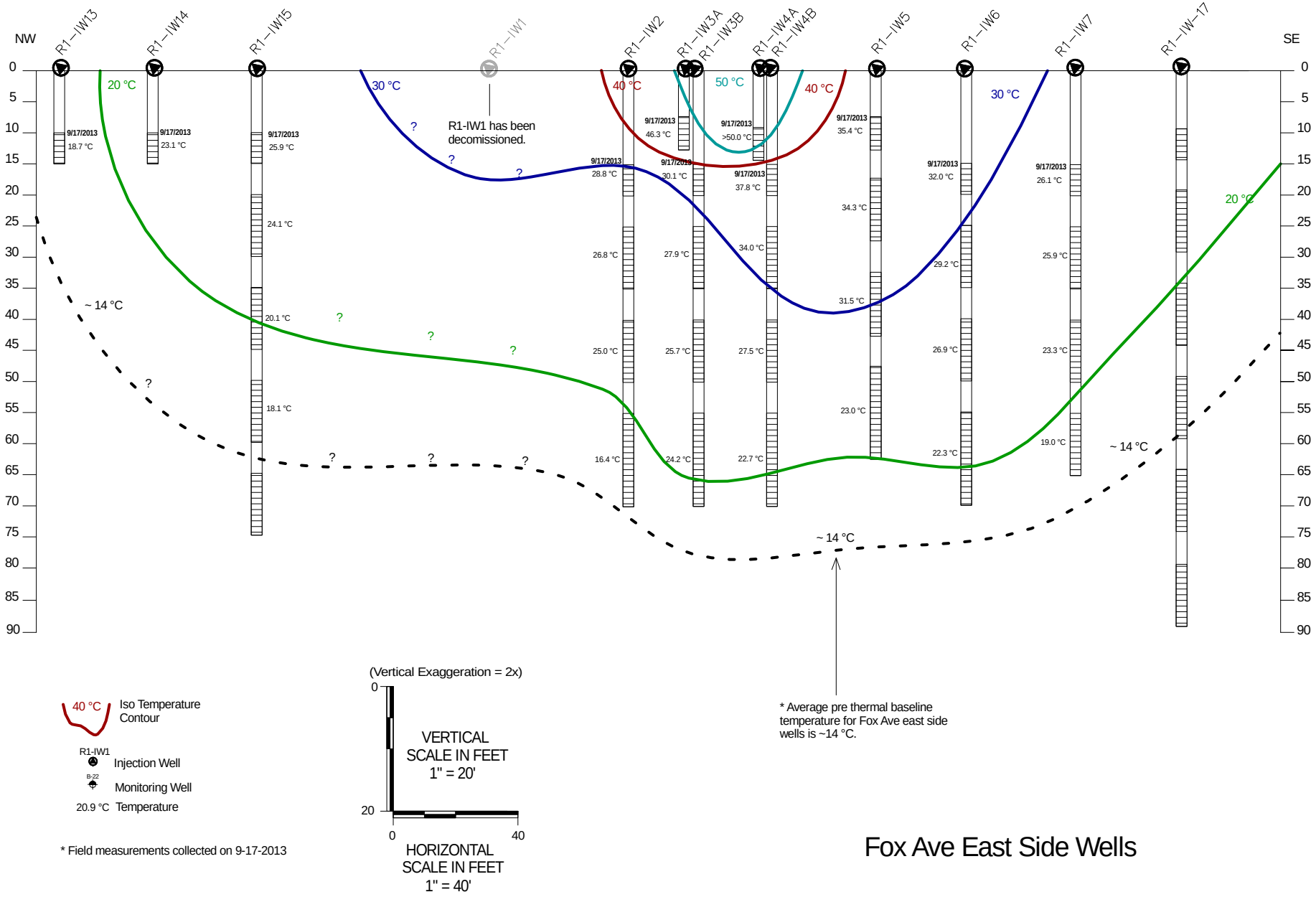
Cross Section Row 1
Fox Avenue Site
Seattle, WA

Figure 2
Temperature Monitoring Row 1 Wells
August 22, 2013
Fox Ave Site



40 °C Iso Temperature Contour

R1-IW1 Injection Well

B-22 Monitoring Well

20.9 °C Temperature

* Field measurements collected on 9-17-2013

(Vertical Exaggeration = 2x)

VERTICAL SCALE IN FEET 1" = 20'

HORIZONTAL SCALE IN FEET 1" = 40'

* Average pre thermal baseline temperature for Fox Ave east side wells is ~14 °C.

Fox Ave East Side Wells

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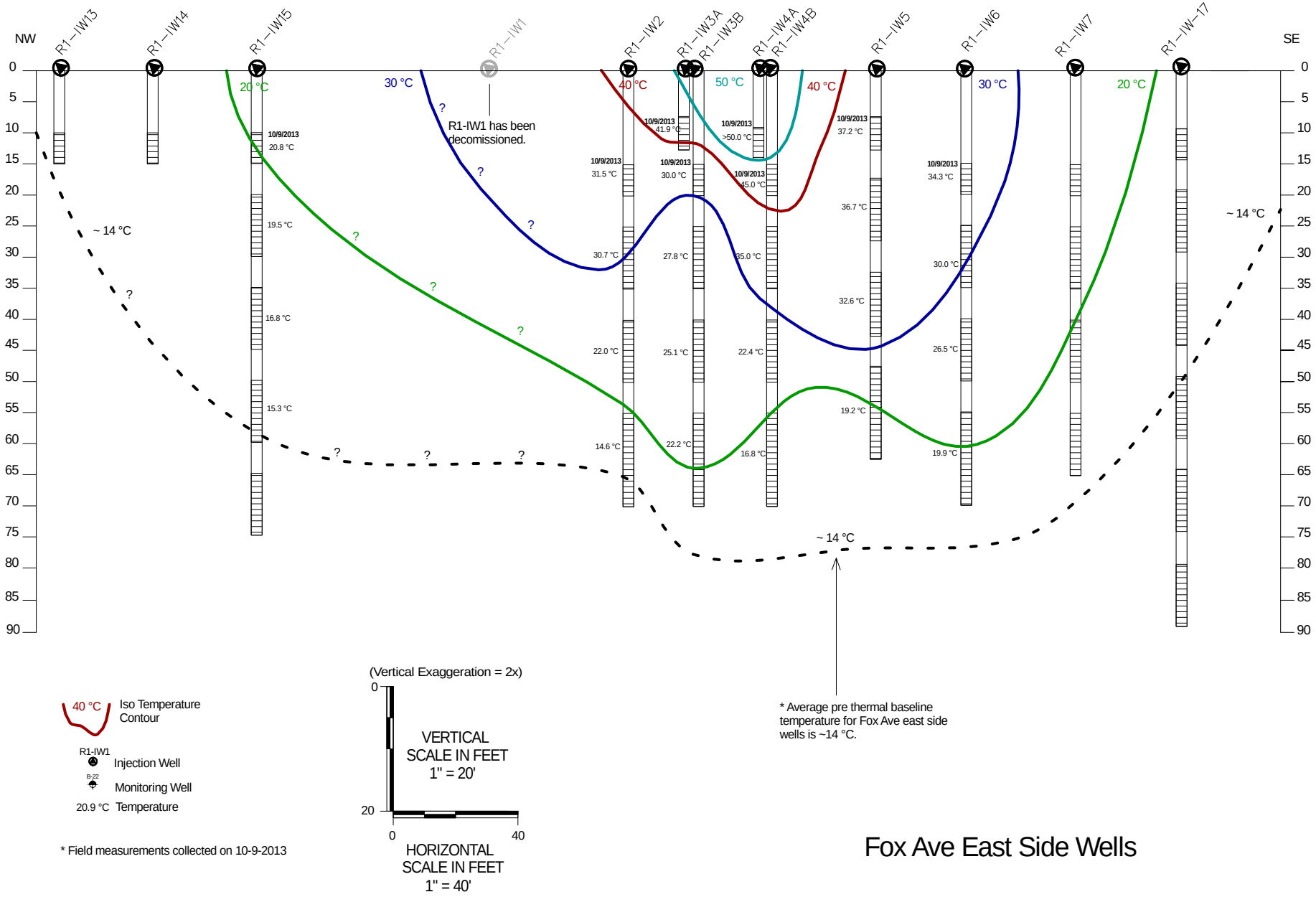
Cross Section Row 1
Fox Avenue Site
Seattle, WA

Figure 3
Temperature Monitoring Row 1 Wells
September 17, 2013
Fox Ave Site



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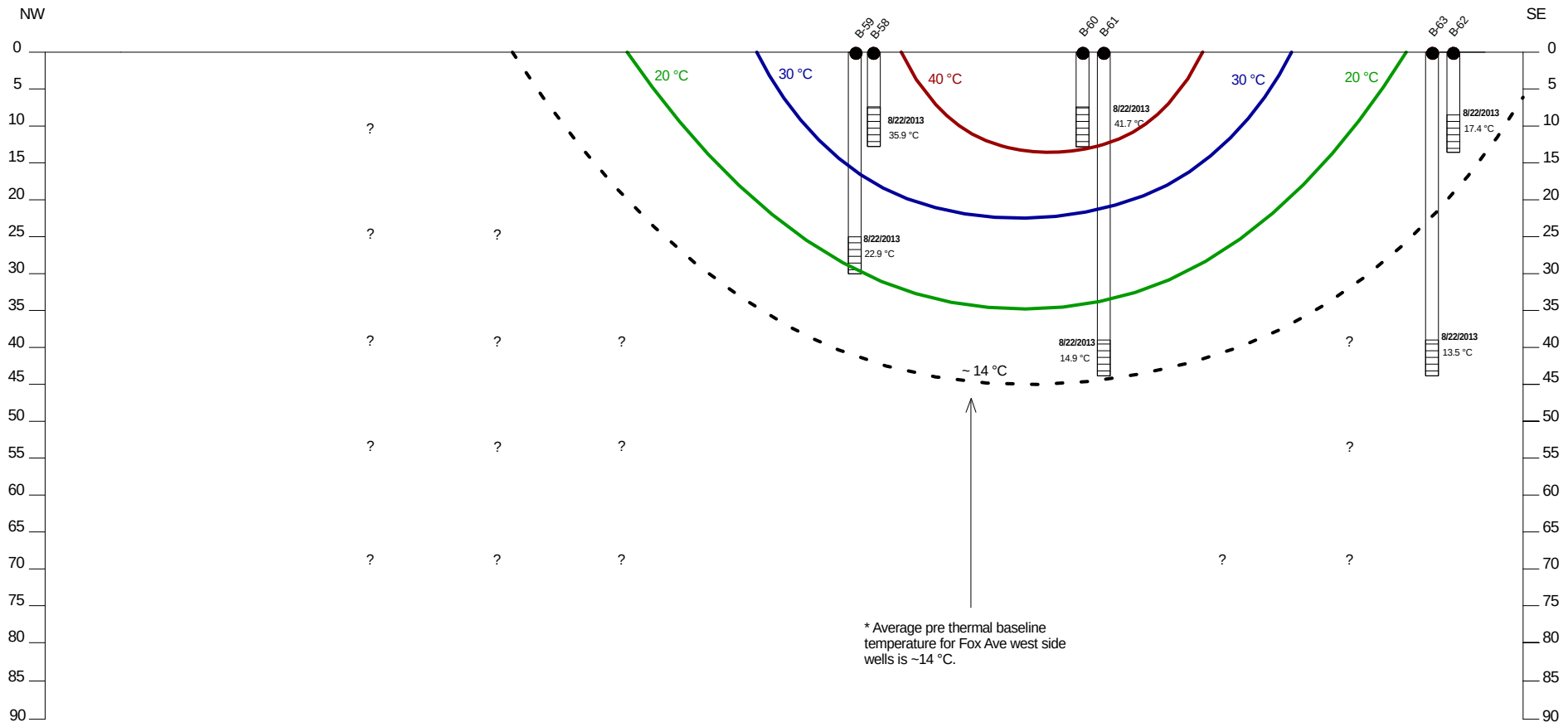
Cross Section Row 1
Fox Avenue Site
Seattle, WA

Figure 4
Temperature Monitoring Row 1 Wells
October 9, 2013
Fox Ave Site



30 °C Iso Temperature Contour

R1-IW1 Injection Well

B-22 Monitoring Well

20.9 °C Temperature

* Field measurements collected on 8-22-2013

(Vertical Exaggeration = 2x)

VERTICAL SCALE IN FEET 1" = 20'

HORIZONTAL SCALE IN FEET 1" = 40'

Fox Ave West Side Wells

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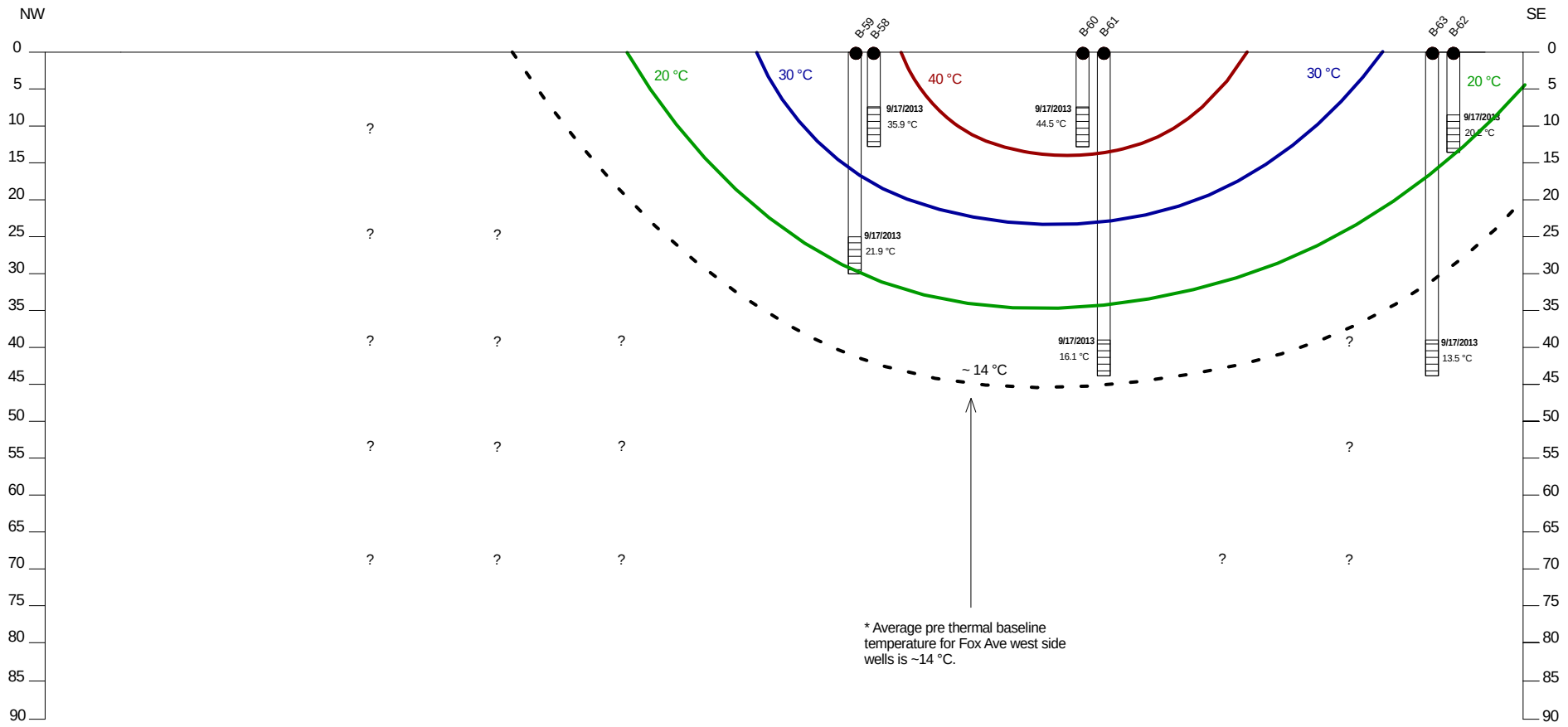
Cross Section Row 1
Fox Avenue Site
Seattle, WA

Figure 5
Temperature Monitoring Row 1 Wells
August 22, 2013
Fox Ave Site



30 °C Iso Temperature Contour

R1-IW1 Injection Well

B-22 Monitoring Well

20.9 °C Temperature

* Field measurements collected on 9-17-2013

(Vertical Exaggeration = 2x)

0

VERTICAL SCALE IN FEET 1" = 20'

20

0 40

HORIZONTAL SCALE IN FEET 1" = 40'

Fox Ave West Side Wells

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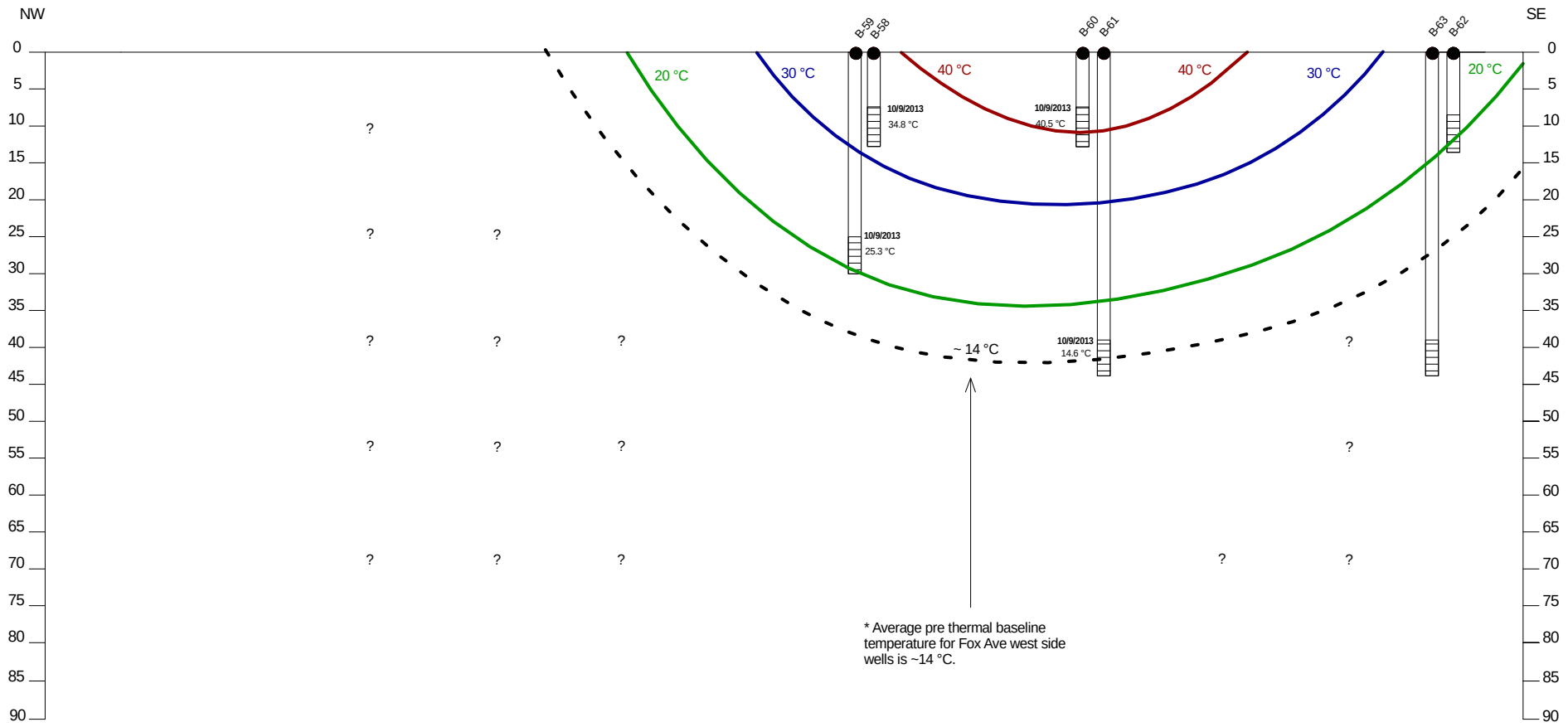
Cross Section Row 1
Fox Avenue Site
Seattle, WA

Figure 6
Temperature Monitoring Row 1 Wells
September 17, 2013
Fox Ave Site



30 °C Iso Temperature Contour

R1-IW1 Injection Well

B-22 Monitoring Well

20.9 °C Temperature

* Field measurements collected on 10-9-2013

(Vertical Exaggeration = 2x)

VERTICAL SCALE IN FEET 1" = 20'

HORIZONTAL SCALE IN FEET 1" = 40'

Fox Ave West Side Wells

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Cross Section Row 1
Fox Avenue Site
Seattle, WA

Figure 7
Temperature Monitoring Row 1 Wells
October 9, 2013
Fox Ave Site

Attachment A
Laboratory Data Packages, Well Logs, UIC Registration

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

Floyd | Snider
Tom Colligan
601 Union St., Suite 600
Seattle, Washington 98101

RE: Fox Ave RA
Lab ID: 1310163

October 25, 2013

Attention Tom Colligan:

Fremont Analytical, Inc. received 2 sample(s) on 10/18/2013 for the analyses presented in the following report.

Volatile Organic Compounds by EPA Method 8260

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,

Michael Dee
Sr. Chemist / Principal

Date: *10/25/2013*

CLIENT: Floyd | Snider
Project: Fox Ave RA
Lab Order: 1310163

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
1310163-001	R1-IW16-101813	10/18/2013 10:35 AM	10/18/2013 12:10 PM
1310163-002	R1-IW21-101813	10/18/2013 11:04 AM	10/18/2013 12:10 PM

Note: If no "Time Collected" is supplied, a default of 12:00AM is assigned

Case Narrative

WO#: **1310163**
Date: **10/25/2013**

CLIENT: Floyd | Snider
Project: Fox Ave RA

I. SAMPLE RECEIPT:
Samples receipt information is recorded on the attached Sample Receipt Checklist.

II. GENERAL REPORTING COMMENTS:
Results are reported on a wet weight basis unless dry-weight correction is denoted in the units field on the analytical report ("mg/kg-dry" or "ug/kg-dry").

Matrix Spike (MS) and MS Duplicate (MSD) samples are tested from an analytical batch of "like" matrix to check for possible matrix effect. The MS and MSD will provide site specific matrix data only for those samples which are spiked by the laboratory. The sample chosen for spike purposes may or may not have been a sample submitted in this sample delivery group. 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 and the MS/MSD 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.

Analytical Report

WO#: **1310163**
Date Reported: **10/25/2013**

Client: Floyd | Snider
Collection Date: 10/18/2013 10:35:00 AM
Project: Fox Ave RA
Lab ID: 1310163-001
Matrix: Water
Client Sample ID: **R1-IW16-101813**

Volatile Organic Compounds by EPA Method 8260

Batch ID: R10695 Analyst: GH

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Dichlorodifluoromethane (CFC-12)	ND	1.00		µg/L	1	10/22/2013 8:37:00 AM
Chloromethane	ND	1.00		µg/L	1	10/22/2013 8:37:00 AM
Vinyl chloride	26.9	0.200		µg/L	1	10/22/2013 8:37:00 AM
Bromomethane	ND	1.00		µg/L	1	10/22/2013 8:37:00 AM
Trichlorofluoromethane (CFC-11)	ND	1.00		µg/L	1	10/22/2013 8:37:00 AM
Chloroethane	ND	1.00		µg/L	1	10/22/2013 8:37:00 AM
1,1-Dichloroethene	ND	1.00		µg/L	1	10/22/2013 8:37:00 AM
Acetone	ND	5.00		µg/L	1	10/22/2013 8:37:00 AM
Methylene chloride	ND	1.00		µg/L	1	10/22/2013 8:37:00 AM
trans-1,2-Dichloroethene	14.6	1.00		µg/L	1	10/22/2013 8:37:00 AM
Methyl tert-butyl ether (MTBE)	ND	1.00		µg/L	1	10/22/2013 8:37:00 AM
1,1-Dichloroethane	2.32	1.00		µg/L	1	10/22/2013 8:37:00 AM
2,2-Dichloropropane	ND	2.00		µg/L	1	10/22/2013 8:37:00 AM
cis-1,2-Dichloroethene	433	20.0	D	µg/L	20	10/23/2013 11:07:00 AM
(MEK) 2-Butanone	ND	1.00		µg/L	1	10/22/2013 8:37:00 AM
Chloroform	1.30	1.00		µg/L	1	10/22/2013 8:37:00 AM
1,1,1-Trichloroethane (TCA)	ND	1.00		µg/L	1	10/22/2013 8:37:00 AM
1,1-Dichloropropene	ND	1.00		µg/L	1	10/22/2013 8:37:00 AM
Carbon tetrachloride	ND	1.00		µg/L	1	10/22/2013 8:37:00 AM
1,2-Dichloroethane (EDC)	1.49	1.00		µg/L	1	10/22/2013 8:37:00 AM
Benzene	5.39	1.00		µg/L	1	10/22/2013 8:37:00 AM
Trichloroethene (TCE)	188	20.0	D	µg/L	20	10/23/2013 11:07:00 AM
1,2-Dichloropropane	6.23	1.00		µg/L	1	10/22/2013 8:37:00 AM
Bromodichloromethane	ND	1.00		µg/L	1	10/22/2013 8:37:00 AM
Dibromomethane	ND	1.00		µg/L	1	10/22/2013 8:37:00 AM
cis-1,3-Dichloropropene	ND	1.00		µg/L	1	10/22/2013 8:37:00 AM
Toluene	1.70	1.00		µg/L	1	10/22/2013 8:37:00 AM
trans-1,3-Dichloropropene	ND	1.00		µg/L	1	10/22/2013 8:37:00 AM
Methyl Isobutyl Ketone (MIBK)	ND	5.00		µg/L	1	10/22/2013 8:37:00 AM
1,1,2-Trichloroethane	ND	1.00		µg/L	1	10/22/2013 8:37:00 AM
1,3-Dichloropropane	ND	1.00		µg/L	1	10/22/2013 8:37:00 AM
Tetrachloroethene (PCE)	700	20.0	D	µg/L	20	10/23/2013 11:07:00 AM
Dibromochloromethane	ND	1.00		µg/L	1	10/22/2013 8:37:00 AM
1,2-Dibromoethane (EDB)	ND	0.0100		µg/L	1	10/22/2013 8:37:00 AM
2-Hexanone	ND	1.00		µg/L	1	10/22/2013 8:37:00 AM

Qualifiers:

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
J	Analyte detected below quantitation limits	ND	Not detected at the Reporting Limit
RL	Reporting Limit	S	Spike recovery outside accepted recovery limits

Analytical Report

WO#: **1310163**
Date Reported: **10/25/2013**

Client: Floyd | Snider
Collection Date: 10/18/2013 10:35:00 AM
Project: Fox Ave RA
Lab ID: 1310163-001
Matrix: Water
Client Sample ID: **R1-IW16-101813**

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Volatile Organic Compounds by EPA Method 8260				Batch ID: R10695		Analyst: GH
Chlorobenzene	ND	1.00		µg/L	1	10/22/2013 8:37:00 AM
1,1,1,2-Tetrachloroethane	ND	1.00		µg/L	1	10/22/2013 8:37:00 AM
Ethylbenzene	ND	1.00		µg/L	1	10/22/2013 8:37:00 AM
m,p-Xylene	ND	1.00		µg/L	1	10/22/2013 8:37:00 AM
o-Xylene	ND	1.00		µg/L	1	10/22/2013 8:37:00 AM
Styrene	ND	1.00		µg/L	1	10/22/2013 8:37:00 AM
Isopropylbenzene	ND	1.00		µg/L	1	10/22/2013 8:37:00 AM
Bromoform	ND	1.00		µg/L	1	10/22/2013 8:37:00 AM
1,1,2,2-Tetrachloroethane	ND	1.00		µg/L	1	10/22/2013 8:37:00 AM
n-Propylbenzene	ND	1.00		µg/L	1	10/22/2013 8:37:00 AM
Bromobenzene	ND	1.00		µg/L	1	10/22/2013 8:37:00 AM
1,3,5-Trimethylbenzene	ND	1.00		µg/L	1	10/22/2013 8:37:00 AM
2-Chlorotoluene	ND	1.00		µg/L	1	10/22/2013 8:37:00 AM
4-Chlorotoluene	ND	1.00		µg/L	1	10/22/2013 8:37:00 AM
tert-Butylbenzene	ND	1.00		µg/L	1	10/22/2013 8:37:00 AM
1,2,3-Trichloropropane	ND	1.00		µg/L	1	10/22/2013 8:37:00 AM
1,2,4-Trichlorobenzene	ND	2.00		µg/L	1	10/22/2013 8:37:00 AM
sec-Butylbenzene	ND	1.00		µg/L	1	10/22/2013 8:37:00 AM
4-Isopropyltoluene	ND	1.00		µg/L	1	10/22/2013 8:37:00 AM
1,3-Dichlorobenzene	ND	1.00		µg/L	1	10/22/2013 8:37:00 AM
1,4-Dichlorobenzene	ND	1.00		µg/L	1	10/22/2013 8:37:00 AM
n-Butylbenzene	ND	1.00		µg/L	1	10/22/2013 8:37:00 AM
1,2-Dichlorobenzene	ND	1.00		µg/L	1	10/22/2013 8:37:00 AM
1,2-Dibromo-3-chloropropane	ND	1.00		µg/L	1	10/22/2013 8:37:00 AM
1,2,4-Trimethylbenzene	ND	1.00		µg/L	1	10/22/2013 8:37:00 AM
Hexachlorobutadiene	ND	4.00		µg/L	1	10/22/2013 8:37:00 AM
Naphthalene	ND	1.00		µg/L	1	10/22/2013 8:37:00 AM
1,2,3-Trichlorobenzene	ND	4.00		µg/L	1	10/22/2013 8:37:00 AM
Surr: 1-Bromo-4-fluorobenzene	97.6	66.8-124		%REC	1	10/22/2013 8:37:00 AM
Surr: Dibromofluoromethane	96.6	72.1-122		%REC	1	10/22/2013 8:37:00 AM
Surr: Toluene-d8	95.5	62.1-129		%REC	1	10/22/2013 8:37:00 AM

Qualifiers:

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
J	Analyte detected below quantitation limits	ND	Not detected at the Reporting Limit
RL	Reporting Limit	S	Spike recovery outside accepted recovery limits

Analytical Report

WO#: **1310163**
Date Reported: **10/25/2013**

Client: Floyd | Snider
Collection Date: 10/18/2013 11:04:00 AM
Project: Fox Ave RA
Lab ID: 1310163-002
Matrix: Water
Client Sample ID: **R1-IW21-101813**

Volatile Organic Compounds by EPA Method 8260

Batch ID: R10695 Analyst: GH

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Dichlorodifluoromethane (CFC-12)	ND	1.00		µg/L	1	10/22/2013 9:04:00 AM
Chloromethane	ND	1.00		µg/L	1	10/22/2013 9:04:00 AM
Vinyl chloride	41.2	0.200		µg/L	1	10/22/2013 9:04:00 AM
Bromomethane	ND	1.00		µg/L	1	10/22/2013 9:04:00 AM
Trichlorofluoromethane (CFC-11)	ND	1.00		µg/L	1	10/22/2013 9:04:00 AM
Chloroethane	ND	1.00		µg/L	1	10/22/2013 9:04:00 AM
1,1-Dichloroethene	5.36	1.00		µg/L	1	10/22/2013 9:04:00 AM
Acetone	517	250	D	µg/L	50	10/23/2013 11:34:00 AM
Methylene chloride	ND	1.00		µg/L	1	10/22/2013 9:04:00 AM
trans-1,2-Dichloroethene	45.6	1.00		µg/L	1	10/22/2013 9:04:00 AM
Methyl tert-butyl ether (MTBE)	ND	1.00		µg/L	1	10/22/2013 9:04:00 AM
1,1-Dichloroethane	2.46	1.00		µg/L	1	10/22/2013 9:04:00 AM
2,2-Dichloropropane	ND	2.00		µg/L	1	10/22/2013 9:04:00 AM
cis-1,2-Dichloroethene	690	50.0	D	µg/L	50	10/23/2013 11:34:00 AM
(MEK) 2-Butanone	115	1.00		µg/L	1	10/22/2013 9:04:00 AM
Chloroform	ND	1.00		µg/L	1	10/22/2013 9:04:00 AM
1,1,1-Trichloroethane (TCA)	ND	1.00		µg/L	1	10/22/2013 9:04:00 AM
1,1-Dichloropropene	ND	1.00		µg/L	1	10/22/2013 9:04:00 AM
Carbon tetrachloride	ND	1.00		µg/L	1	10/22/2013 9:04:00 AM
1,2-Dichloroethane (EDC)	2.17	1.00		µg/L	1	10/22/2013 9:04:00 AM
Benzene	17.1	1.00		µg/L	1	10/22/2013 9:04:00 AM
Trichloroethene (TCE)	264	50.0	D	µg/L	50	10/23/2013 11:34:00 AM
1,2-Dichloropropane	6.78	1.00		µg/L	1	10/22/2013 9:04:00 AM
Bromodichloromethane	ND	1.00		µg/L	1	10/22/2013 9:04:00 AM
Dibromomethane	ND	1.00		µg/L	1	10/22/2013 9:04:00 AM
cis-1,3-Dichloropropene	ND	1.00		µg/L	1	10/22/2013 9:04:00 AM
Toluene	31.2	1.00		µg/L	1	10/22/2013 9:04:00 AM
trans-1,3-Dichloropropene	ND	1.00		µg/L	1	10/22/2013 9:04:00 AM
Methyl Isobutyl Ketone (MIBK)	32.9	5.00		µg/L	1	10/22/2013 9:04:00 AM
1,1,2-Trichloroethane	ND	1.00		µg/L	1	10/22/2013 9:04:00 AM
1,3-Dichloropropane	ND	1.00		µg/L	1	10/22/2013 9:04:00 AM
Tetrachloroethene (PCE)	1,320	50.0	D	µg/L	50	10/23/2013 11:34:00 AM
Dibromochloromethane	ND	1.00		µg/L	1	10/22/2013 9:04:00 AM
1,2-Dibromoethane (EDB)	ND	0.0100		µg/L	1	10/22/2013 9:04:00 AM
2-Hexanone	1.87	1.00		µg/L	1	10/22/2013 9:04:00 AM

Qualifiers:

- 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
- J Analyte detected below quantitation limits
- ND Not detected at the Reporting Limit
- RL Reporting Limit
- S Spike recovery outside accepted recovery limits

Analytical Report

WO#: **1310163**

Date Reported: **10/25/2013**

Client: Floyd | Snider **Collection Date:** 10/18/2013 11:04:00 AM

Project: Fox Ave RA

Lab ID: 1310163-002 **Matrix:** Water

Client Sample ID: **R1-IW21-101813**

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Volatile Organic Compounds by EPA Method 8260				Batch ID: R10695		Analyst: GH
Chlorobenzene	15.6	1.00		µg/L	1	10/22/2013 9:04:00 AM
1,1,1,2-Tetrachloroethane	ND	1.00		µg/L	1	10/22/2013 9:04:00 AM
Ethylbenzene	20.8	1.00		µg/L	1	10/22/2013 9:04:00 AM
m,p-Xylene	30.3	1.00		µg/L	1	10/22/2013 9:04:00 AM
o-Xylene	20.2	1.00		µg/L	1	10/22/2013 9:04:00 AM
Styrene	ND	1.00		µg/L	1	10/22/2013 9:04:00 AM
Isopropylbenzene	2.16	1.00		µg/L	1	10/22/2013 9:04:00 AM
Bromoform	ND	1.00		µg/L	1	10/22/2013 9:04:00 AM
1,1,2,2-Tetrachloroethane	ND	1.00		µg/L	1	10/22/2013 9:04:00 AM
n-Propylbenzene	1.58	1.00		µg/L	1	10/22/2013 9:04:00 AM
Bromobenzene	ND	1.00		µg/L	1	10/22/2013 9:04:00 AM
1,3,5-Trimethylbenzene	2.62	1.00		µg/L	1	10/22/2013 9:04:00 AM
2-Chlorotoluene	2.07	1.00		µg/L	1	10/22/2013 9:04:00 AM
4-Chlorotoluene	ND	1.00		µg/L	1	10/22/2013 9:04:00 AM
tert-Butylbenzene	ND	1.00		µg/L	1	10/22/2013 9:04:00 AM
1,2,3-Trichloropropane	ND	1.00		µg/L	1	10/22/2013 9:04:00 AM
1,2,4-Trichlorobenzene	ND	2.00		µg/L	1	10/22/2013 9:04:00 AM
sec-Butylbenzene	ND	1.00		µg/L	1	10/22/2013 9:04:00 AM
4-Isopropyltoluene	ND	1.00		µg/L	1	10/22/2013 9:04:00 AM
1,3-Dichlorobenzene	16.2	1.00		µg/L	1	10/22/2013 9:04:00 AM
1,4-Dichlorobenzene	55.7	1.00		µg/L	1	10/22/2013 9:04:00 AM
n-Butylbenzene	ND	1.00		µg/L	1	10/22/2013 9:04:00 AM
1,2-Dichlorobenzene	248	50.0	D	µg/L	50	10/23/2013 11:34:00 AM
1,2-Dibromo-3-chloropropane	ND	1.00		µg/L	1	10/22/2013 9:04:00 AM
1,2,4-Trimethylbenzene	11.3	1.00		µg/L	1	10/22/2013 9:04:00 AM
Hexachlorobutadiene	ND	4.00		µg/L	1	10/22/2013 9:04:00 AM
Naphthalene	2.06	1.00		µg/L	1	10/22/2013 9:04:00 AM
1,2,3-Trichlorobenzene	ND	4.00		µg/L	1	10/22/2013 9:04:00 AM
Surr: 1-Bromo-4-fluorobenzene	101	66.8-124		%REC	1	10/22/2013 9:04:00 AM
Surr: Dibromofluoromethane	96.7	72.1-122		%REC	1	10/22/2013 9:04:00 AM
Surr: Toluene-d8	97.9	62.1-129		%REC	1	10/22/2013 9:04:00 AM

Qualifiers:

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
J	Analyte detected below quantitation limits	ND	Not detected at the Reporting Limit
RL	Reporting Limit	S	Spike recovery outside accepted recovery limits

Work Order: 1310163
CLIENT: Floyd | Snider
Project: Fox Ave RA

QC SUMMARY REPORT

Volatile Organic Compounds by EPA Method 8260

Sample ID: **1310167-002ADUP** SampType: **DUP** Units: **µg/L** Prep Date: **10/22/2013** RunNo: **10695**
Client ID: **BATCH** Batch ID: **R10695** Analysis Date: **10/22/2013** SeqNo: **213915**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Dichlorodifluoromethane (CFC-12)	ND	1.00						0		30	
Chloromethane	ND	1.00						0		30	
Vinyl chloride	ND	0.200						0		30	
Bromomethane	ND	1.00						0		30	
Trichlorofluoromethane (CFC-11)	ND	1.00						0		30	
Chloroethane	ND	1.00						0		30	
1,1-Dichloroethene	ND	1.00						0		30	
Acetone	ND	5.00						0		30	
Methylene chloride	ND	1.00						0		30	
trans-1,2-Dichloroethene	ND	1.00						0		30	
Methyl tert-butyl ether (MTBE)	ND	1.00						0		30	
1,1-Dichloroethane	ND	1.00						0		30	
2,2-Dichloropropane	ND	2.00						0		30	
cis-1,2-Dichloroethene	ND	1.00						0		30	
(MEK) 2-Butanone	ND	5.00						0		30	
Chloroform	ND	1.00						0		30	
1,1,1-Trichloroethane (TCA)	ND	1.00						0		30	
1,1-Dichloropropene	ND	1.00						0		30	
Carbon tetrachloride	ND	1.00						0		30	
1,2-Dichloroethane (EDC)	ND	1.00						0		30	
Benzene	ND	1.00						0		30	
Trichloroethene (TCE)	ND	1.00						0		30	
1,2-Dichloropropane	ND	1.00						0		30	
Bromodichloromethane	ND	1.00						0		30	
Dibromomethane	ND	1.00						0		30	
cis-1,3-Dichloropropene	ND	1.00						0		30	
Toluene	ND	1.00						0		30	
trans-1,3-Dichloropropene	ND	1.00						0		30	
Methyl Isobutyl Ketone (MIBK)	ND	5.00						0		30	

Qualifiers:

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	J	Analyte detected below quantitation limits	ND	Not detected at the Reporting Limit
R	RPD outside accepted recovery limits	RL	Reporting Limit	S	Spike recovery outside accepted recovery limits

Work Order: 1310163
CLIENT: Floyd | Snider
Project: Fox Ave RA

QC SUMMARY REPORT

Volatile Organic Compounds by EPA Method 8260

Sample ID: **1310167-002ADUP** SampType: **DUP** Units: **µg/L** Prep Date: **10/22/2013** RunNo: **10695**
Client ID: **BATCH** Batch ID: **R10695** Analysis Date: **10/22/2013** SeqNo: **213915**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
1,1,2-Trichloroethane	ND	1.00						0		30	
1,3-Dichloropropane	ND	1.00						0		30	
Tetrachloroethene (PCE)	ND	1.00						0		30	
Dibromochloromethane	ND	1.00						0		30	
1,2-Dibromoethane (EDB)	ND	0.0100						0		30	
2-Hexanone	ND	1.00						0		30	
Chlorobenzene	ND	1.00						0		30	
1,1,1,2-Tetrachloroethane	ND	1.00						0		30	
Ethylbenzene	ND	1.00						0		30	
m,p-Xylene	ND	1.00						0		30	
o-Xylene	ND	1.00						0		30	
Styrene	ND	1.00						0		30	
Isopropylbenzene	ND	1.00						0		30	
Bromoform	ND	1.00						0		30	
1,1,2,2-Tetrachloroethane	ND	1.00						0		30	
n-Propylbenzene	ND	1.00						0		30	
Bromobenzene	ND	1.00						0		30	
1,3,5-Trimethylbenzene	ND	1.00						0		30	
2-Chlorotoluene	ND	1.00						0		30	
4-Chlorotoluene	ND	1.00						0		30	
tert-Butylbenzene	ND	1.00						0		30	
1,2,3-Trichloropropane	ND	1.00						0		30	
1,2,4-Trichlorobenzene	ND	2.00						0		30	
sec-Butylbenzene	ND	1.00						0		30	
4-Isopropyltoluene	ND	1.00						0		30	
1,3-Dichlorobenzene	ND	1.00						0		30	
1,4-Dichlorobenzene	ND	1.00						0		30	
n-Butylbenzene	ND	1.00						0		30	
1,2-Dichlorobenzene	ND	1.00						0		30	

Qualifiers:

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	J	Analyte detected below quantitation limits	ND	Not detected at the Reporting Limit
R	RPD outside accepted recovery limits	RL	Reporting Limit	S	Spike recovery outside accepted recovery limits

Work Order: 1310163
CLIENT: Floyd | Snider
Project: Fox Ave RA

QC SUMMARY REPORT

Volatile Organic Compounds by EPA Method 8260

Sample ID: **1310167-002ADUP** SampType: **DUP** Units: **µg/L** Prep Date: **10/22/2013** RunNo: **10695**
Client ID: **BATCH** Batch ID: **R10695** Analysis Date: **10/22/2013** SeqNo: **213915**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
1,2-Dibromo-3-chloropropane	ND	1.00						0		30	
1,2,4-Trimethylbenzene	ND	1.00						0		30	
Hexachlorobutadiene	ND	4.00						0		30	
Naphthalene	ND	1.00						0		30	
1,2,3-Trichlorobenzene	ND	4.00						0		30	
Surr: Dibromofluoromethane	48.1		50.00		96.2	72.1	122		0		
Surr: Toluene-d8	48.4		50.00		96.7	62.1	129		0		
Surr: 1-Bromo-4-fluorobenzene	48.6		50.00		97.1	66.8	124		0		

Sample ID: **1310167-003AMS** SampType: **MS** Units: **µg/L** Prep Date: **10/22/2013** RunNo: **10695**
Client ID: **BATCH** Batch ID: **R10695** Analysis Date: **10/22/2013** SeqNo: **213917**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Dichlorodifluoromethane (CFC-12)	17.3	1.00	20.00	0	86.7	33.3	122				
Chloromethane	20.6	1.00	20.00	0	103	48.2	145				
Vinyl chloride	21.8	0.200	20.00	0	109	45.6	149				
Bromomethane	19.5	1.00	20.00	0	97.5	31.5	135				
Trichlorofluoromethane (CFC-11)	21.4	1.00	20.00	0	107	54.7	138				
Chloroethane	22.0	1.00	20.00	0	110	49.9	143				
1,1-Dichloroethene	21.9	1.00	20.00	0	109	63	141				
Acetone	53.7	5.00	50.00	0	107	50.8	135				
Methylene chloride	22.3	1.00	20.00	0	111	61.6	135				
trans-1,2-Dichloroethene	22.6	1.00	20.00	0	113	63.5	138				
Methyl tert-butyl ether (MTBE)	21.7	1.00	20.00	0	109	60.9	132				
1,1-Dichloroethane	22.9	1.00	20.00	0	114	67.8	136				
2,2-Dichloropropane	15.6	2.00	20.00	0	78.1	31.5	121				
cis-1,2-Dichloroethene	22.1	1.00	20.00	0	110	67.1	123				
(MEK) 2-Butanone	54.6	5.00	50.00	0	109	61.8	132				

Qualifiers:

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	J	Analyte detected below quantitation limits	ND	Not detected at the Reporting Limit
R	RPD outside accepted recovery limits	RL	Reporting Limit	S	Spike recovery outside accepted recovery limits

Work Order: 1310163
CLIENT: Floyd | Snider
Project: Fox Ave RA

QC SUMMARY REPORT

Volatile Organic Compounds by EPA Method 8260

Sample ID: **1310167-003AMS** SampType: **MS** Units: **µg/L** Prep Date: **10/22/2013** RunNo: **10695**
Client ID: **BATCH** Batch ID: **R10695** Analysis Date: **10/22/2013** SeqNo: **213917**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloroform	21.9	1.00	20.00	0	110	66.7	136				
1,1,1-Trichloroethane (TCA)	22.2	1.00	20.00	0	111	64.2	146				
1,1-Dichloropropene	22.2	1.00	20.00	0	111	73.8	136				
Carbon tetrachloride	22.2	1.00	20.00	0	111	62.7	146				
1,2-Dichloroethane (EDC)	22.3	1.00	20.00	0	111	63.4	137				
Benzene	22.4	1.00	20.00	0	112	65.4	138				
Trichloroethene (TCE)	21.2	1.00	20.00	0	106	60.4	134				
1,2-Dichloropropane	22.2	1.00	20.00	0	111	62.6	138				
Bromodichloromethane	22.3	1.00	20.00	0	111	59.4	139				
Dibromomethane	21.7	1.00	20.00	0	108	63.6	139				
cis-1,3-Dichloropropene	20.8	1.00	20.00	0	104	63.8	132				
Toluene	22.4	1.00	20.00	0	112	64	139				
trans-1,3-Dichloropropene	20.6	1.00	20.00	0	103	57.7	125				
Methyl Isobutyl Ketone (MIBK)	54.3	5.00	50.00	0	109	59.5	139				
1,1,2-Trichloroethane	22.6	1.00	20.00	0	113	59.4	127				
1,3-Dichloropropane	22.2	1.00	20.00	0	111	64.3	135				
Tetrachloroethene (PCE)	21.6	1.00	20.00	0	108	50.3	133				
Dibromochloromethane	22.0	1.00	20.00	0	110	61.6	139				
1,2-Dibromoethane (EDB)	21.5	0.0100	20.00	0	108	63.2	134				
2-Hexanone	56.3	1.00	50.00	0	113	58.3	137				
Chlorobenzene	21.6	1.00	20.00	0	108	65.8	134				
1,1,1,2-Tetrachloroethane	21.7	1.00	20.00	0	108	65.4	135				
Ethylbenzene	21.6	1.00	20.00	0	108	64.5	136				
m,p-Xylene	43.2	1.00	40.00	0	108	63.3	135				
o-Xylene	21.5	1.00	20.00	0	108	65.4	134				
Styrene	21.5	1.00	20.00	0	108	59.1	134				
Isopropylbenzene	20.4	1.00	20.00	0	102	56	147				
Bromoform	21.5	1.00	20.00	0	108	57.7	139				
1,1,2,2-Tetrachloroethane	22.9	1.00	20.00	0	114	59.8	146				

Qualifiers:

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	J	Analyte detected below quantitation limits	ND	Not detected at the Reporting Limit
R	RPD outside accepted recovery limits	RL	Reporting Limit	S	Spike recovery outside accepted recovery limits

Work Order: 1310163
CLIENT: Floyd | Snider
Project: Fox Ave RA

QC SUMMARY REPORT

Volatile Organic Compounds by EPA Method 8260

Sample ID: **1310167-003AMS**	SampType: **MS**	Units: **µg/L**	Prep Date: **10/22/2013**	RunNo: **10695**
Client ID: **BATCH**	Batch ID: **R10695**		Analysis Date: **10/22/2013**	SeqNo: **213917**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
n-Propylbenzene	21.7	1.00	20.00	0	109	57.6	142				
Bromobenzene	21.0	1.00	20.00	0	105	63.6	130				
1,3,5-Trimethylbenzene	21.0	1.00	20.00	0	105	59.9	136				
2-Chlorotoluene	21.6	1.00	20.00	0	108	61.7	134				
4-Chlorotoluene	21.8	1.00	20.00	0	109	58.4	134				
tert-Butylbenzene	23.9	1.00	20.00	0	119	66.8	141				
1,2,3-Trichloropropane	20.6	1.00	20.00	0	103	62.4	129				
1,2,4-Trichlorobenzene	20.4	2.00	20.00	0	102	50.9	133				
sec-Butylbenzene	21.2	1.00	20.00	0	106	56	146				
4-Isopropyltoluene	21.0	1.00	20.00	0	105	56.4	136				
1,3-Dichlorobenzene	22.0	1.00	20.00	0	110	58.2	128				
1,4-Dichlorobenzene	22.3	1.00	20.00	0	112	60.1	123				
n-Butylbenzene	21.2	1.00	20.00	0	106	54.6	135				
1,2-Dichlorobenzene	22.3	1.00	20.00	0	112	65.4	133				
1,2-Dibromo-3-chloropropane	22.4	1.00	20.00	0	112	51.8	142				
1,2,4-Trimethylbenzene	21.5	1.00	20.00	0	107	63.7	132				
Hexachlorobutadiene	20.4	4.00	20.00	0	102	58.1	130				
Naphthalene	21.6	1.00	20.00	0	108	54.5	132				
1,2,3-Trichlorobenzene	20.8	4.00	20.00	0	104	57	131				
Surr: Dibromofluoromethane	48.3		50.00		96.5	72.1	122				
Surr: Toluene-d8	48.0		50.00		96.1	62.1	129				
Surr: 1-Bromo-4-fluorobenzene	49.1		50.00		98.1	66.8	124				

Sample ID: **LCS-R10695**	SampType: **LCS**	Units: **µg/L**	Prep Date: **10/22/2013**	RunNo: **10695**
Client ID: **LCSW**	Batch ID: **R10695**		Analysis Date: **10/22/2013**	SeqNo: **213929**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Dichlorodifluoromethane (CFC-12)	18.1	1.00	20.00	0	90.3	43.1	127				

Qualifiers:

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	J	Analyte detected below quantitation limits	ND	Not detected at the Reporting Limit
R	RPD outside accepted recovery limits	RL	Reporting Limit	S	Spike recovery outside accepted recovery limits

Work Order: 1310163
CLIENT: Floyd | Snider
Project: Fox Ave RA

QC SUMMARY REPORT

Volatile Organic Compounds by EPA Method 8260

Sample ID: **LCS-R10695** SampType: **LCS** Units: **µg/L** Prep Date: **10/22/2013** RunNo: **10695**
Client ID: **LCSW** Batch ID: **R10695** Analysis Date: **10/22/2013** SeqNo: **213929**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloromethane	20.3	1.00	20.00	0	102	42.5	131				
Vinyl chloride	20.5	0.200	20.00	0	102	56.2	130				
Bromomethane	22.5	1.00	20.00	0	112	45.4	138				
Trichlorofluoromethane (CFC-11)	20.0	1.00	20.00	0	100	64.7	129				
Chloroethane	20.8	1.00	20.00	0	104	62.5	123				
1,1-Dichloroethene	19.7	1.00	20.00	0	98.4	60.7	146				
Acetone	54.4	5.00	50.00	0	109	49.1	161				
Methylene chloride	20.5	1.00	20.00	0	102	60.3	135				
trans-1,2-Dichloroethene	20.5	1.00	20.00	0	103	71.3	129				
Methyl tert-butyl ether (MTBE)	20.1	1.00	20.00	0	100	75.4	123				
1,1-Dichloroethane	20.8	1.00	20.00	0	104	71.3	129				
2,2-Dichloropropane	14.7	2.00	20.00	0	73.5	37.8	132				
cis-1,2-Dichloroethene	20.6	1.00	20.00	0	103	67.5	127				
(MEK) 2-Butanone	48.0	5.00	50.00	0	96.0	70	130				
Chloroform	20.6	1.00	20.00	0	103	70.3	123				
1,1,1-Trichloroethane (TCA)	20.0	1.00	20.00	0	100	67.9	134				
1,1-Dichloropropene	20.7	1.00	20.00	0	103	72.1	133				
Carbon tetrachloride	20.4	1.00	20.00	0	102	68	136				
1,2-Dichloroethane (EDC)	20.1	1.00	20.00	0	100	65.8	126				
Benzene	20.4	1.00	20.00	0	102	75.2	124				
Trichloroethene (TCE)	22.3	1.00	20.00	0	111	71.9	130				
1,2-Dichloropropane	20.2	1.00	20.00	0	101	71.9	131				
Bromodichloromethane	20.5	1.00	20.00	0	102	70	130				
Dibromomethane	20.5	1.00	20.00	0	102	74.2	125				
cis-1,3-Dichloropropene	19.5	1.00	20.00	0	97.3	62.8	135				
Toluene	20.8	1.00	20.00	0	104	75.2	129				
trans-1,3-Dichloropropene	19.1	1.00	20.00	0	95.6	58.1	138				
Methyl Isobutyl Ketone (MIBK)	49.1	5.00	50.00	0	98.3	64.6	139				
1,1,2-Trichloroethane	20.1	1.00	20.00	0	100	65.4	128				

Qualifiers:

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	J	Analyte detected below quantitation limits	ND	Not detected at the Reporting Limit
R	RPD outside accepted recovery limits	RL	Reporting Limit	S	Spike recovery outside accepted recovery limits

Work Order: 1310163
CLIENT: Floyd | Snider
Project: Fox Ave RA

QC SUMMARY REPORT

Volatile Organic Compounds by EPA Method 8260

Sample ID: **LCS-R10695** SampType: **LCS** Units: **µg/L** Prep Date: **10/22/2013** RunNo: **10695**
Client ID: **LCSW** Batch ID: **R10695** Analysis Date: **10/22/2013** SeqNo: **213929**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
1,3-Dichloropropane	20.2	1.00	20.00	0	101	71.9	131				
Tetrachloroethene (PCE)	19.9	1.00	20.00	0	99.4	52.4	140				
Dibromochloromethane	19.8	1.00	20.00	0	98.8	68.7	139				
1,2-Dibromoethane (EDB)	19.7	0.0100	20.00	0	98.5	71.2	129				
2-Hexanone	49.6	1.00	50.00	0	99.2	70	130				
Chlorobenzene	19.9	1.00	20.00	0	99.4	77.2	122				
1,1,1,2-Tetrachloroethane	19.6	1.00	20.00	0	98.2	76.2	130				
Ethylbenzene	20.2	1.00	20.00	0	101	78	127				
m,p-Xylene	40.4	1.00	40.00	0	101	77.5	130				
o-Xylene	20.5	1.00	20.00	0	103	77.6	126				
Styrene	20.3	1.00	20.00	0	102	66.8	137				
Isopropylbenzene	21.4	1.00	20.00	0	107	75.9	133				
Bromoform	19.1	1.00	20.00	0	95.7	69.9	142				
1,1,2,2-Tetrachloroethane	16.6	1.00	20.00	0	83.2	68	134				
n-Propylbenzene	20.4	1.00	20.00	0	102	77.1	133				
Bromobenzene	19.5	1.00	20.00	0	97.5	71.1	131				
1,3,5-Trimethylbenzene	20.2	1.00	20.00	0	101	76.2	133				
2-Chlorotoluene	20.2	1.00	20.00	0	101	67.1	137				
4-Chlorotoluene	20.4	1.00	20.00	0	102	70.7	132				
tert-Butylbenzene	19.8	1.00	20.00	0	99.1	71.3	139				
1,2,3-Trichloropropane	18.4	1.00	20.00	0	92.1	70.8	132				
1,2,4-Trichlorobenzene	19.8	2.00	20.00	0	98.8	61.4	139				
sec-Butylbenzene	20.0	1.00	20.00	0	100	77.4	136				
4-Isopropyltoluene	19.7	1.00	20.00	0	98.6	78.1	131				
1,3-Dichlorobenzene	20.5	1.00	20.00	0	102	73.5	125				
1,4-Dichlorobenzene	20.9	1.00	20.00	0	105	71.4	125				
n-Butylbenzene	20.3	1.00	20.00	0	101	69.8	138				
1,2-Dichlorobenzene	20.6	1.00	20.00	0	103	74.2	123				
1,2-Dibromo-3-chloropropane	20.4	1.00	20.00	0	102	66.1	138				

Qualifiers:

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	J	Analyte detected below quantitation limits	ND	Not detected at the Reporting Limit
R	RPD outside accepted recovery limits	RL	Reporting Limit	S	Spike recovery outside accepted recovery limits

Work Order: 1310163
CLIENT: Floyd | Snider
Project: Fox Ave RA

QC SUMMARY REPORT

Volatile Organic Compounds by EPA Method 8260

Sample ID: **LCS-R10695**	SampType: **LCS**	Units: **µg/L**	Prep Date: **10/22/2013**	RunNo: **10695**
Client ID: **LCSW**	Batch ID: **R10695**		Analysis Date: **10/22/2013**	SeqNo: **213929**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
1,2,4-Trimethylbenzene	19.9	1.00	20.00	0	99.5	72.3	133				
Hexachlorobutadiene	19.7	4.00	20.00	0	98.4	60.9	141				
Naphthalene	19.3	1.00	20.00	0	96.6	58.2	140				
1,2,3-Trichlorobenzene	19.5	4.00	20.00	0	97.3	61.3	133				
Surr: Dibromofluoromethane	46.5		50.00		92.9	72.1	122				
Surr: Toluene-d8	48.1		50.00		96.3	62.1	129				
Surr: 1-Bromo-4-fluorobenzene	48.4		50.00		96.8	66.8	124				

Sample ID: **MB-R10695**	SampType: **MBLK**	Units: **µg/L**	Prep Date: **10/22/2013**	RunNo: **10695**
Client ID: **MBLKW**	Batch ID: **R10695**		Analysis Date: **10/22/2013**	SeqNo: **213930**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Dichlorodifluoromethane (CFC-12)	ND	1.00									
Chloromethane	ND	1.00									
Vinyl chloride	ND	0.200									
Bromomethane	ND	1.00									
Trichlorofluoromethane (CFC-11)	ND	1.00									
Chloroethane	ND	1.00									
1,1-Dichloroethene	ND	1.00									
Acetone	ND	5.00									
Methylene chloride	ND	1.00									
trans-1,2-Dichloroethene	ND	1.00									
Methyl tert-butyl ether (MTBE)	ND	1.00									
1,1-Dichloroethane	ND	1.00									
2,2-Dichloropropane	ND	2.00									
cis-1,2-Dichloroethene	ND	1.00									
(MEK) 2-Butanone	ND	5.00									
Chloroform	ND	1.00									

Qualifiers:

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	J	Analyte detected below quantitation limits	ND	Not detected at the Reporting Limit
R	RPD outside accepted recovery limits	RL	Reporting Limit	S	Spike recovery outside accepted recovery limits

Work Order: 1310163
CLIENT: Floyd | Snider
Project: Fox Ave RA

QC SUMMARY REPORT

Volatile Organic Compounds by EPA Method 8260

Sample ID: **MB-R10695** SampType: **MBLK** Units: **µg/L** Prep Date: **10/22/2013** RunNo: **10695**
Client ID: **MBLKW** Batch ID: **R10695** Analysis Date: **10/22/2013** SeqNo: **213930**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
1,1,1-Trichloroethane (TCA)	ND	1.00									
1,1-Dichloropropene	ND	1.00									
Carbon tetrachloride	ND	1.00									
1,2-Dichloroethane (EDC)	ND	1.00									
Benzene	ND	1.00									
Trichloroethene (TCE)	ND	1.00									
1,2-Dichloropropane	ND	1.00									
Bromodichloromethane	ND	1.00									
Dibromomethane	ND	1.00									
cis-1,3-Dichloropropene	ND	1.00									
Toluene	ND	1.00									
trans-1,3-Dichloropropene	ND	1.00									
Methyl Isobutyl Ketone (MIBK)	ND	5.00									
1,1,2-Trichloroethane	ND	1.00									
1,3-Dichloropropane	ND	1.00									
Tetrachloroethene (PCE)	ND	1.00									
Dibromochloromethane	ND	1.00									
1,2-Dibromoethane (EDB)	ND	0.0100									
2-Hexanone	ND	1.00									
Chlorobenzene	ND	1.00									
1,1,1,2-Tetrachloroethane	ND	1.00									
Ethylbenzene	ND	1.00									
m,p-Xylene	ND	1.00									
o-Xylene	ND	1.00									
Styrene	ND	1.00									
Isopropylbenzene	ND	1.00									
Bromoform	ND	1.00									
1,1,2,2-Tetrachloroethane	ND	1.00									
n-Propylbenzene	ND	1.00									

Qualifiers:

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	J	Analyte detected below quantitation limits	ND	Not detected at the Reporting Limit
R	RPD outside accepted recovery limits	RL	Reporting Limit	S	Spike recovery outside accepted recovery limits

Work Order: 1310163
CLIENT: Floyd | Snider
Project: Fox Ave RA

QC SUMMARY REPORT

Volatile Organic Compounds by EPA Method 8260

Sample ID: **MB-R10695**	SampType: **MBLK**	Units: **µg/L**	Prep Date: **10/22/2013**	RunNo: **10695**
Client ID: **MBLKW**	Batch ID: **R10695**		Analysis Date: **10/22/2013**	SeqNo: **213930**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Bromobenzene	ND	1.00									
1,3,5-Trimethylbenzene	ND	1.00									
2-Chlorotoluene	ND	1.00									
4-Chlorotoluene	ND	1.00									
tert-Butylbenzene	ND	1.00									
1,2,3-Trichloropropane	ND	1.00									
1,2,4-Trichlorobenzene	ND	2.00									
sec-Butylbenzene	ND	1.00									
4-Isopropyltoluene	ND	1.00									
1,3-Dichlorobenzene	ND	1.00									
1,4-Dichlorobenzene	ND	1.00									
n-Butylbenzene	ND	1.00									
1,2-Dichlorobenzene	ND	1.00									
1,2-Dibromo-3-chloropropane	ND	1.00									
1,2,4-Trimethylbenzene	ND	1.00									
Hexachlorobutadiene	ND	4.00									
Naphthalene	ND	1.00									
1,2,3-Trichlorobenzene	ND	4.00									
Surr: Dibromofluoromethane	47.7		50.00		95.4	72.1	122				
Surr: Toluene-d8	48.2		50.00		96.5	62.1	129				
Surr: 1-Bromo-4-fluorobenzene	48.3		50.00		96.6	66.8	124				

Sample ID: **CCV-R10695B**	SampType: **CCV**	Units: **µg/L**	Prep Date: **10/23/2013**	RunNo: **10695**
Client ID: **CCV**	Batch ID: **R10695**		Analysis Date: **10/23/2013**	SeqNo: **214087**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
cis-1,2-Dichloroethene	22.0	1.00	20.00	0	110	80	120				
Trichloroethene (TCE)	20.4	1.00	20.00	0	102	80	120				

Qualifiers:

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	J	Analyte detected below quantitation limits	ND	Not detected at the Reporting Limit
R	RPD outside accepted recovery limits	RL	Reporting Limit	S	Spike recovery outside accepted recovery limits

Work Order: 1310163
CLIENT: Floyd | Snider
Project: Fox Ave RA

QC SUMMARY REPORT

Volatile Organic Compounds by EPA Method 8260

Sample ID: **CCV-R10695B** SampType: **CCV** Units: **µg/L** Prep Date: **10/23/2013** RunNo: **10695**
Client ID: **CCV** Batch ID: **R10695** Analysis Date: **10/23/2013** SeqNo: **214087**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Tetrachloroethene (PCE)	21.6	1.00	20.00	0	108	80	120				
Surr: Toluene-d8	49.0		50.00		98.1	62.1	129				
Surr: 1-Bromo-4-fluorobenzene	49.0		50.00		97.9	66.8	124				

Qualifiers:

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	J	Analyte detected below quantitation limits	ND	Not detected at the Reporting Limit
R	RPD outside accepted recovery limits	RL	Reporting Limit	S	Spike recovery outside accepted recovery limits

Sample Log-In Check List

Client Name:	**FS**	Work Order Number:	**1310163**
Logged by:	**Chelsea Ward**	Date Received:	**10/18/2013 12:10:00 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 ☐
	Samples received straight from field			
4.	Shipping container/cooler in good condition?	Yes ☑	No ☐	
5.	Custody seals intact on shipping container/cooler?	Yes ☐	No ☐	Not Required ☑
6.	Was an attempt made to cool the samples?	Yes ☐	No ☐	NA ☑
7.	Were all coolers 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 the 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

Fremont Analytical

Chain of Custody Record

3600 Fremont Ave N.
Seattle, WA 98103
Tel: 206-352-3790
Fax: 206-352-7178

Laboratory Project No (internal): 1310163

Date: 10/18/13

Page: 1 of: 1

Client: Floyd Snider /Calibre

Project Name: Fox Avenue

Address:

Location: Fox Ave

City, State, Zip

Tel:

Collected by: Grant Dawson

Reports To (PM): Tom Culligan

Fax:

Email:

Project No:

	Sample Name	Sample Date	Sample Time	Sample Type (Matrix)	VOC (EPA 8260)	GX/BTEX by EPA 8021b	BTEX by 8260	Gasoline Range Organics	Hydrocarbon Identification (HCID)	Diesel/Heavy Oil Range Organics	SEMI VOL (EPA 8270)	PAH (EPA 8270 - SIM)	PCBs (EPA 8082)	Cl Pesticides (EPA 8081)	Cl Herbicides (EPA 8151A)	Metals* (6020 / 200.8)	Total (T) | Dissolved (D)	Anions (IC)**			Comments/Depth
1	RI-IW16-101813	10/18/13	1035	H_2O	X																12 ft'
2	RI-IW21-101813	10/18/13	1104	H_2O	X																12 ft'
3																					
4																					
5																					
6																					
7																					
8																					
9																					
10																					

*Metals Analysis (Circle): MTCA-5 RCRA-8 Priority Pollutants TAL *Individual:* Ag Al As B Ba Be Ca Cd Co Cr Cu Fe Hg K Mg Mn Mo Na Ni Pb Sb Se Sr Sn Ti Tl U V Zn

**Anions (Circle): Nitrate Nitrite Chloride Sulfate Bromide O-Phosphate Fluoride Nitrate-Nitrite

Sample Disposal: ☐ Return to Client ☐ Disposal by Lab (A fee may be assessed if samples are retained after 30 days.)

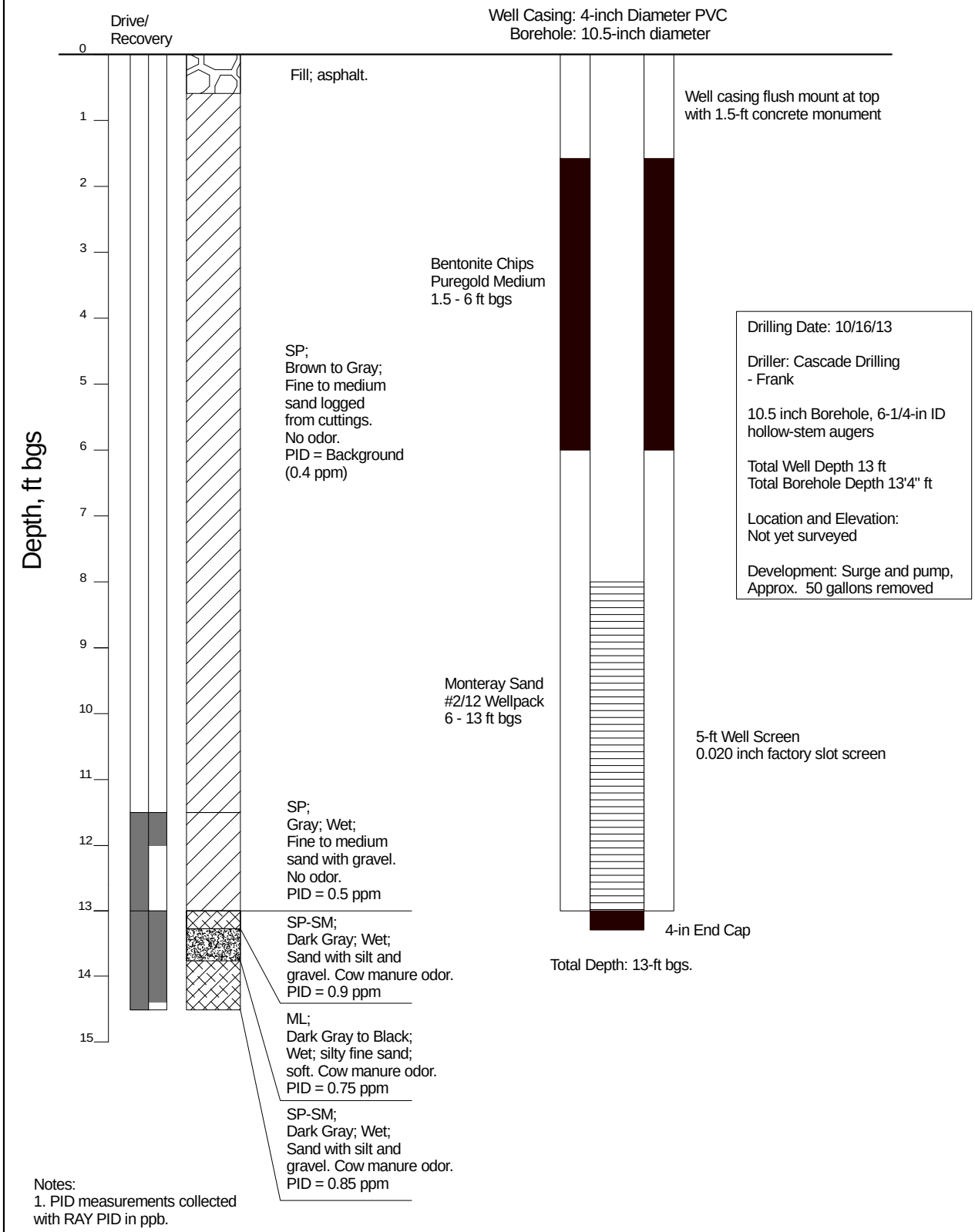
Special Remarks:

Relinquished	Date/Time	Received	Date/Time
x	10/18/13 1210		10/18/13 1210
Relinquished	Date/Time	Received	Date/Time
x		x	

TAT -> Next Day 2 Day 3 Day STD

Distribution: White - Lab, Yellow - File, Pink - Originator

www.fremontanalytical.com



Notes:
1. PID measurements collected with RAY PID in ppb.

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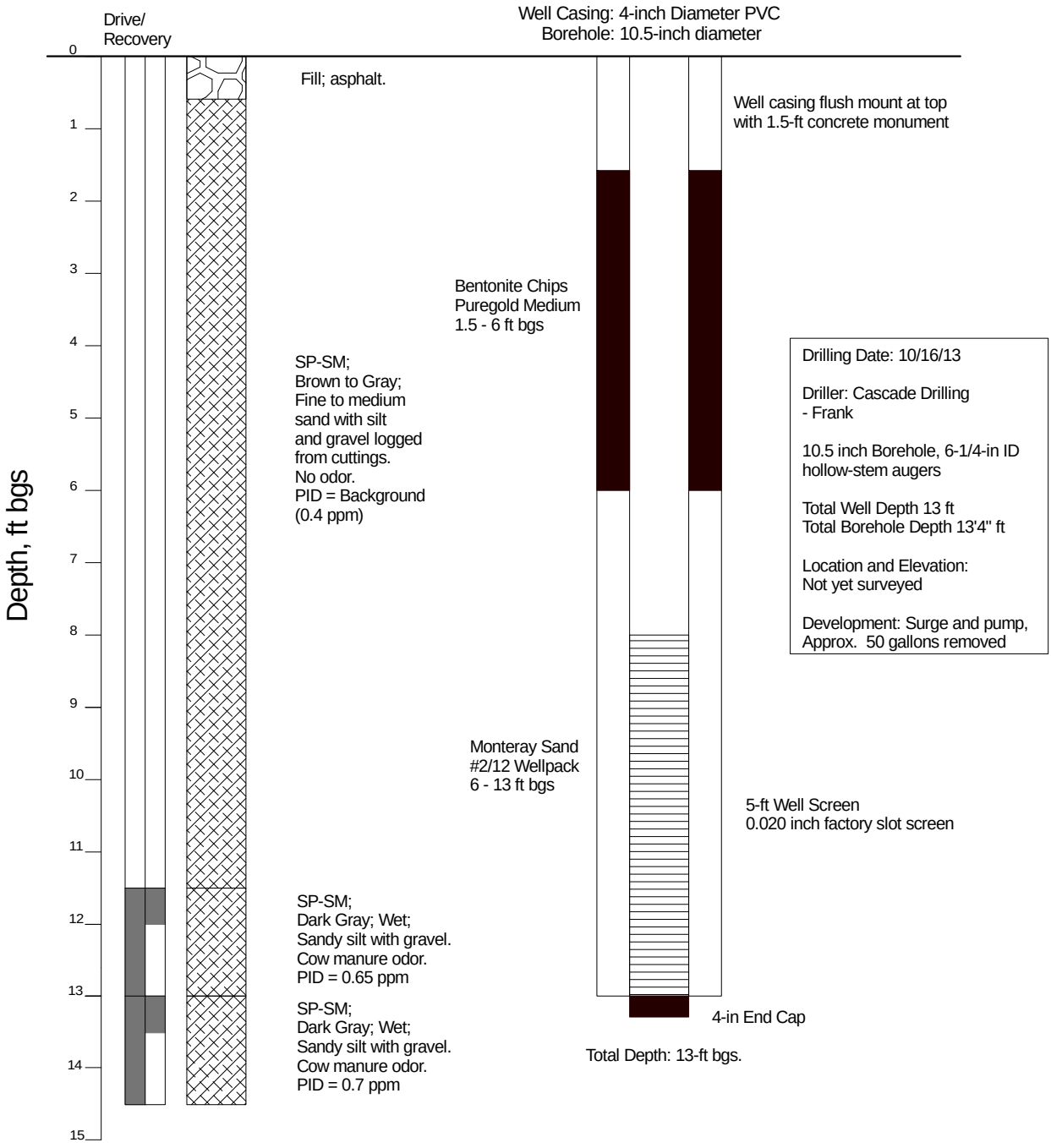
Injection Well Completion
Fox Avenue Site
Seattle, WA

Injection Well: R1-IW16



Notes:
1. PID measurements collected
with RAY PID in ppb.
2. Did not get acceptable recovery on either split spoon sample (11.5' to 13' or 13' to 14.5').
Installed well identical to R1-IW16 since wells are in close proximity to each other.

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Injection Well Completion
Fox Avenue Site
Seattle, WA

Injection Well: R1-IW21

Underground Injection Control (UIC)

Non-Endangerment Registration

Automatically Meet the Nonendangerment Standard

For Class V wells that automatically meet the non endangerment standard in accordance with WAC 173-218-100.

Registration Status

Site Number: 32266
Authorization Status: Rule-Authorized
Comments:

Facility/Site Information

Facility Name: Cascade Columbia Distribution
Address: 6900 Fox Ave S
PO Box/Suite/Building:
City: Seattle
State: WA **ZIP:** 98108
Phone: 206-282-6334
County: King
Facility Site ID:

Contact Information

Well Owner
Name: Bob Code
Organization: Cascade Columbia Distribution
Address: 6900 Fox Ave S
PO Box/Suite/Building:
City: Seattle
State: WA **ZIP:** 98108
E-mail: bobc@cascadecolumbia.com
Phone: 206-282-6334

Property Owner
Name: Bob Code
Organization: Cascade Columbia Distribution
Address: 6900 Fox Ave S
PO Box/Suite/Building:
City: Seattle
State: WA **ZIP:** 98108
E-mail: bobc@cascadecolumbia.com
Phone: 206-282-6334

Technical Contact
Name: Tom McKeon
Organization: CALIBRE Systems, Inc.
Address: 16935 SE 39th St.
PO Box:
City: Bellevue
State: WA **ZIP:** 98008
E-mail: tom.mckeon@calibresys.com
Phone: 425-241-8449

Main Well Information

Well Name	UIC Well Type From Section C (1-12)	Construction Date	EPA Well Type	Status	Depth of UIC Well (ft.)	Latitude	Longitude
R1-IW21	12	10/16/2013	5X26 - Aquifer remediation	Active	13	47.540302	122.326592
R1-IW16	12	10/16/2013	5X26 - Aquifer remediation	Active	13	47.540360	122.326734

Main Well Information (continued)

Well Name	Permit Type	Permit ID	Permit Issuer
R1-IW21	MTCA	DE 6486	Ecology
R1-IW16	MTCA	DE 6486	Ecology

UIC Registration Signature Page

Site Number/ID: 32266

I hereby certify that the information contained in the above referenced registration is true and correct to the best of my knowledge.

Justin Neste — Name of legally authorized representative

Project Scientist - CALIBRE — Title

[signature] — Signature of legally authorized representative

10/17/13 — Date

Please return this signed and dated signature page, along with any required documentation, to:

Washington State Department of Ecology
ATTN: UIC Coordinator, Water Quality Program
P.O. Box 47600
Olympia, WA 98504-7600

- or -

Fax to: (360) 407-6426

- or -

Scan and email to: maha461@ecy.wa.gov