7th Avenue and Bethany Home Road Water Quality Assurance Revolving Fund Site

January 8, 2014

Pilot test

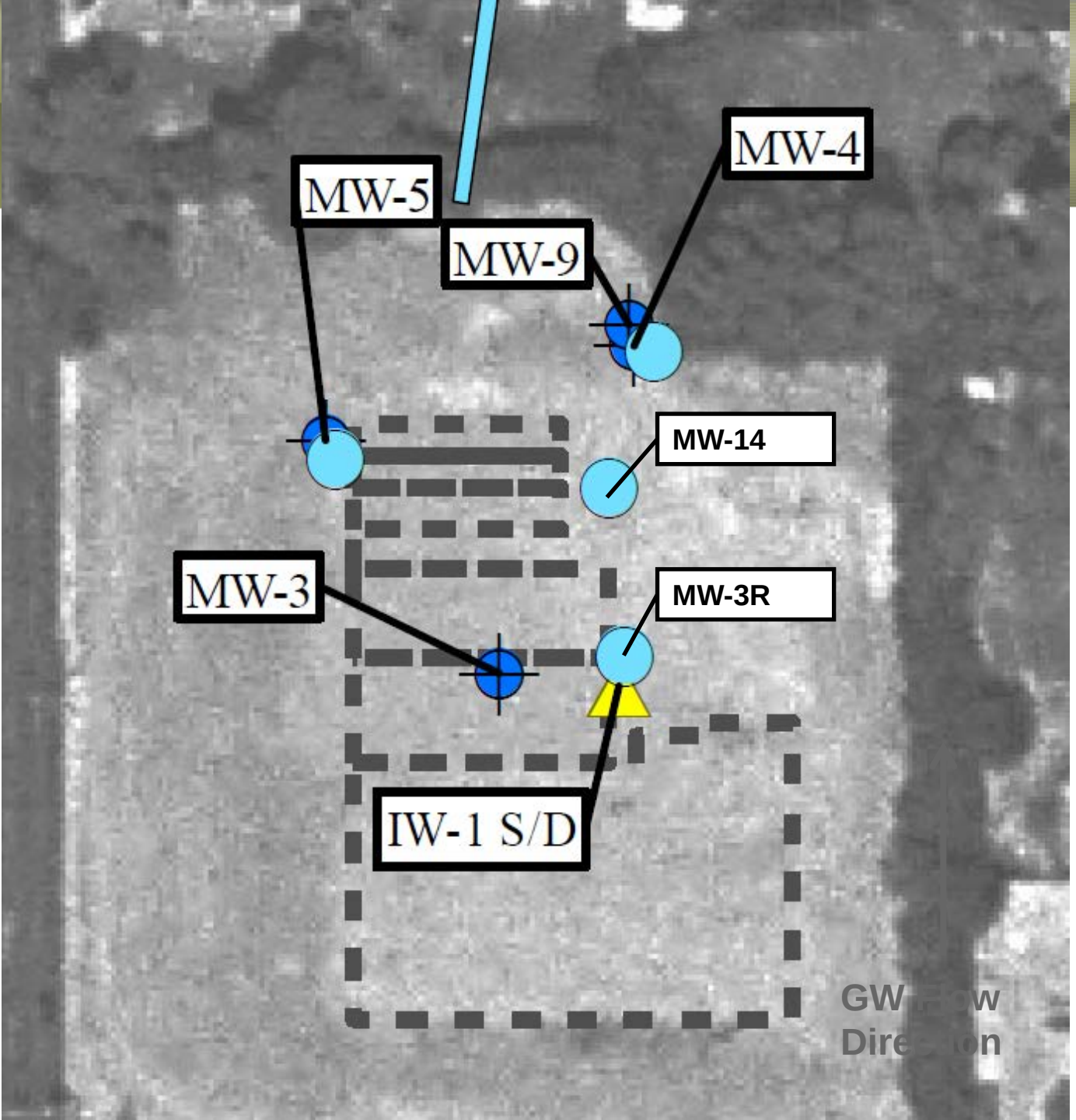
- Two injections of molasses completed to date. First injection 4/23/13 to 5/3/13. Second injection 9/10/13 to 10/11/13. First injection 24,000 gallons, second injection 40,000 gallons. Two percent molasses injected both times.

- Initial results of the pilot test for enhanced reductive de-chlorination have proceeded far enough for ADEQ to feel comfortable with the proof of concept.

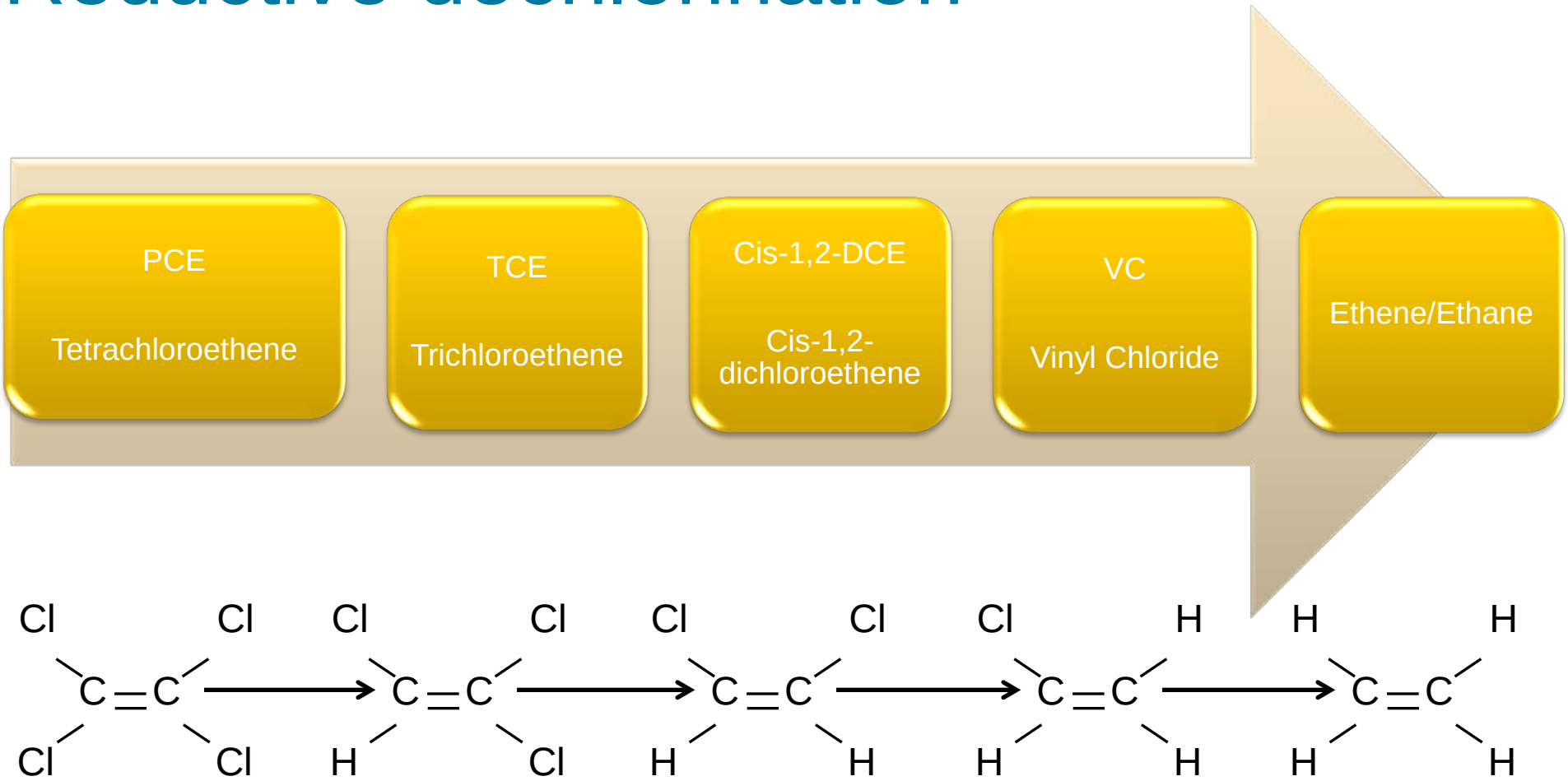
- Arcadis will proceed with final design and cost estimate based on results of the pilot test.

Pilot Test

Pilot Test



Reductive dechlorination



Dominant pathway for reductive dechlorination of chlorinated ethenes. Other compounds may include trans-1,2-dichloroethene or 1,1-dichloroethene

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Pilot test data

Table 1
Dose Response Wells Performance Monitoring Results
7th Avenue and Bethany Home Road Water Quality Assurance Revolving Fund (WQARF) Site,
Phoenix, Arizona

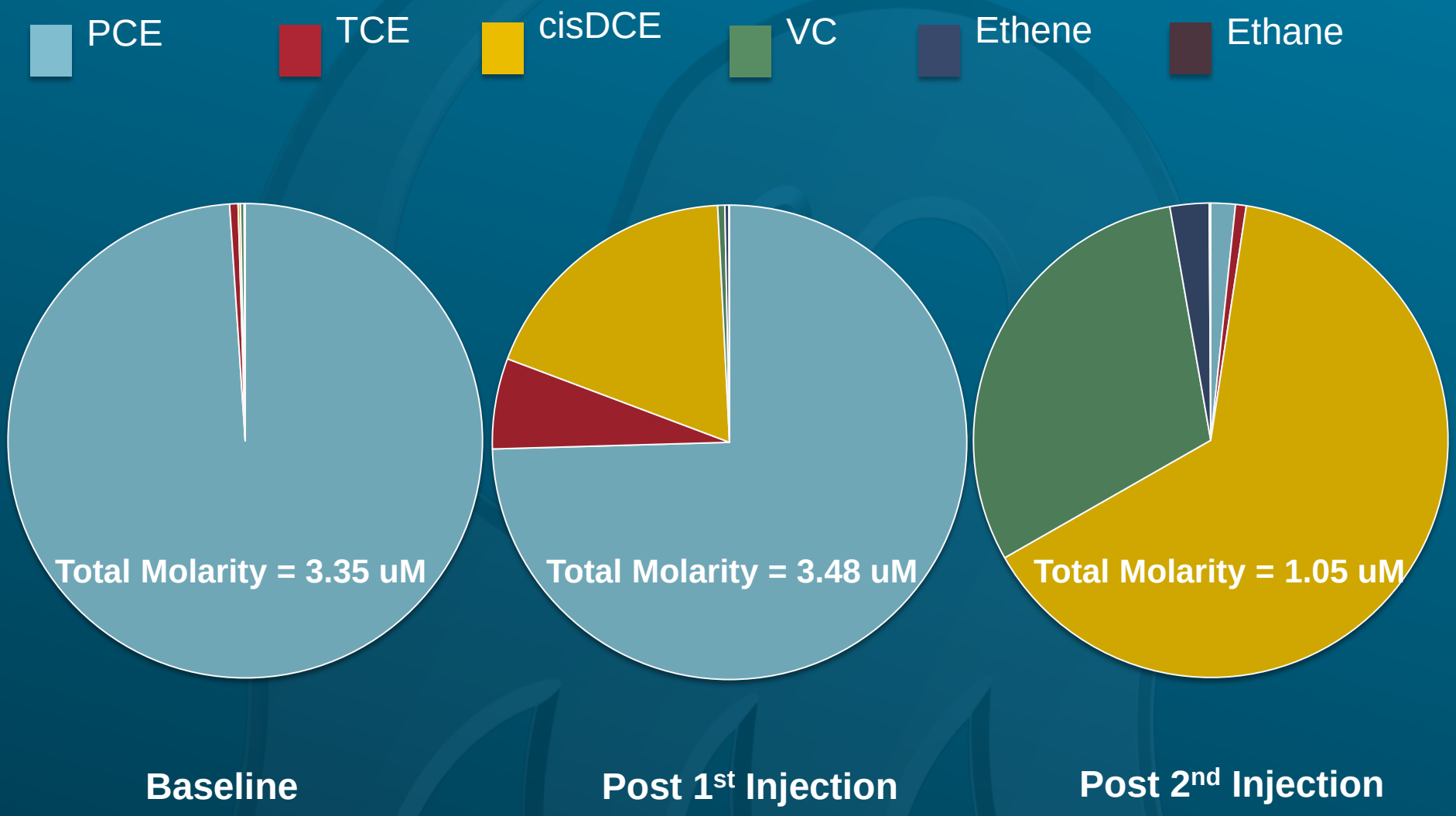
Well ID	Sample Date	Sample Depth	Dissolved Gasses			Volatile Organic Compounds												
			Methane	Ethane	Ethene	PCE	MTBE	TCE	1,2-DCA	cis-1,2-DCE	trans-1,2-DCE	VC	MEK	Naphthalene	Benzene	Toluene	Ethylbenzene	Xylenes
	AWQS		**NA**	**NA**	**NA**	**5**	**NA**	**5**	**5**	**70**	**100**	**2**	**NA**	**NA**	**5**	**1000**	**700**	**10000**
MW-3	*4/9/2013*	*95*	*0.29*	*0.016J*	*0.047*	***550***	*ND*	*2.5*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
	8/1/2013	85	7000	0.011J	0.022J	**170**	<1.0	**8.4**	<1.0	61	<1.0	<1.0	<10.0	<5	<1.0	<5.0	<1.0	<3.0
	8/1/2013	90	9600	0.056	0.19	**430**	<1.0	**14**	<1.0	45	<1.0	<1.0	<10.0	7.4	<1.0	<5.0	<1.0	<3.0
	8/1/2013	95	9200	0.065	0.23	**350**	<1.0	**28**	<1.0	57	<1.0	<1.0	<10.0	7.3	<1.0	<5.0	<1.0	<3.0
	10/30/2013	85	12000	0.034	0.42	2.9	<1.0	<1.0	<1.0	63	<1.0	**16**	760	<5.0	<1.0	<5.0	<1.0	<3.0
	10/30/2013	90	12000	0.030	0.67	2.4	<1.0	<1.0	<1.0	64	<1.0	**19**	730	<5.0	<1.0	<5.0	<1.0	<3.0
MW-3R	*4/9/2013*	*96*	*4.9*	*0.66*	*1.3*	***230***	*ND*	*1.2*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*0.61*	*ND*	*ND*
	8/1/2013	85	10000	0.13	11	**3,100**	<1.0	**48**	<1.0	36	<1.0	**12**	<10.0	<5.0	1.8	<5.0	<1.0	<3.0
	8/1/2013	95	13000	0.20	15	**3,700**	<1.0	**52**	<1.0	39	<1.0	**14**	<10.0	<5.0	<1	<5.0	<1.0	<3.0
	8/1/2013	105	13000	0.092	15	**3,500**	<1.0	**52**	<1.0	39	<1.0	**14**	<10.0	<5.0	1	<5.0	<1.0	<3.0
	10/30/2013	85	14000	6.1	14	3	<1.0	2.4	<1.0	**120**	<1.0	**96**	240	<5.0	<1.0	<5.0	<1.0	<3.0
	10/30/2013	95	11000	4.60	12	1.1	<1.0	2.3	<1.0	**110**	<1.0	**95**	270	<5.0	<1.0	<5.0	<1.0	<3.0
	10/30/2013	105	14000	6.0	18	<1.0	<1.0	1.5	<1.0	**100**	<1.0	**99**	250	<5.0	<1.0	<5.0	<1.0	<3.0

Notes:
All concentrations are in micrograms per liter (ug/L).
Samples collectd on 8-1-13 were done by Passive Diffusion Bags.
AWQS = Arizona Aquifer Water Quality Standards
1,2-DCA = 1,2-Dichloroethane
cis-1,2-DCE = cis-1,2-Dichloroethene
MEK = 2-Butanone
MTBE = Methyl-tert-butyl Ether

NA = Not Applicable
ND = Non Detect
NS = Constituent Not Sampled For
PCE = Tetrachloroethene
TCE = Trichloroethene
trans-1,2-DCE = trans-1,2-Dichloroethene
VC = Vinyl Chloride

< = Not detected at or above analyte specific reporting limit.
Qualifiers:
J = Estimated concentraion greater than the set method detection limit (M
Italics = Baseline data
Bold = Exceeds AWQS

MW-3



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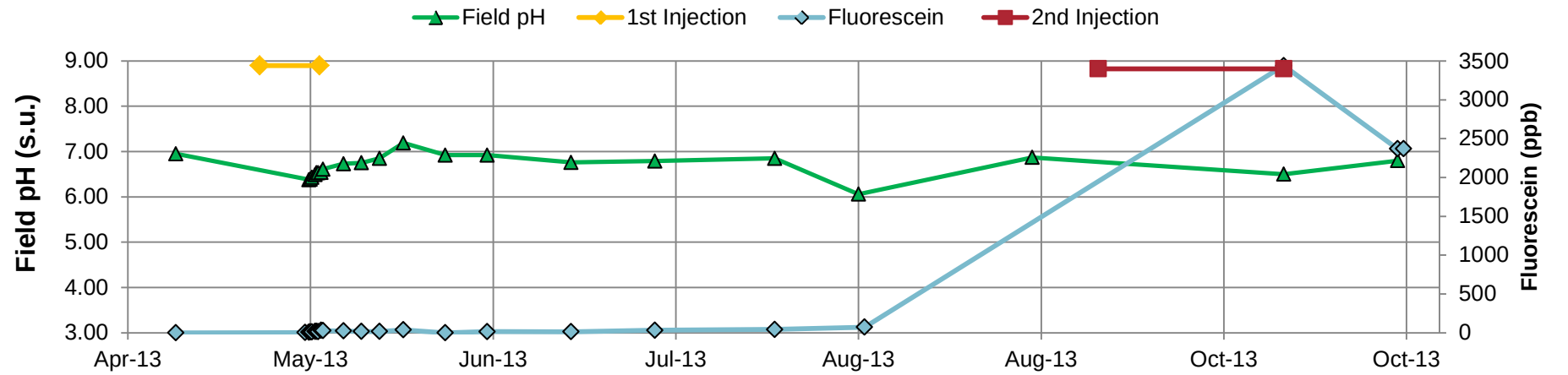
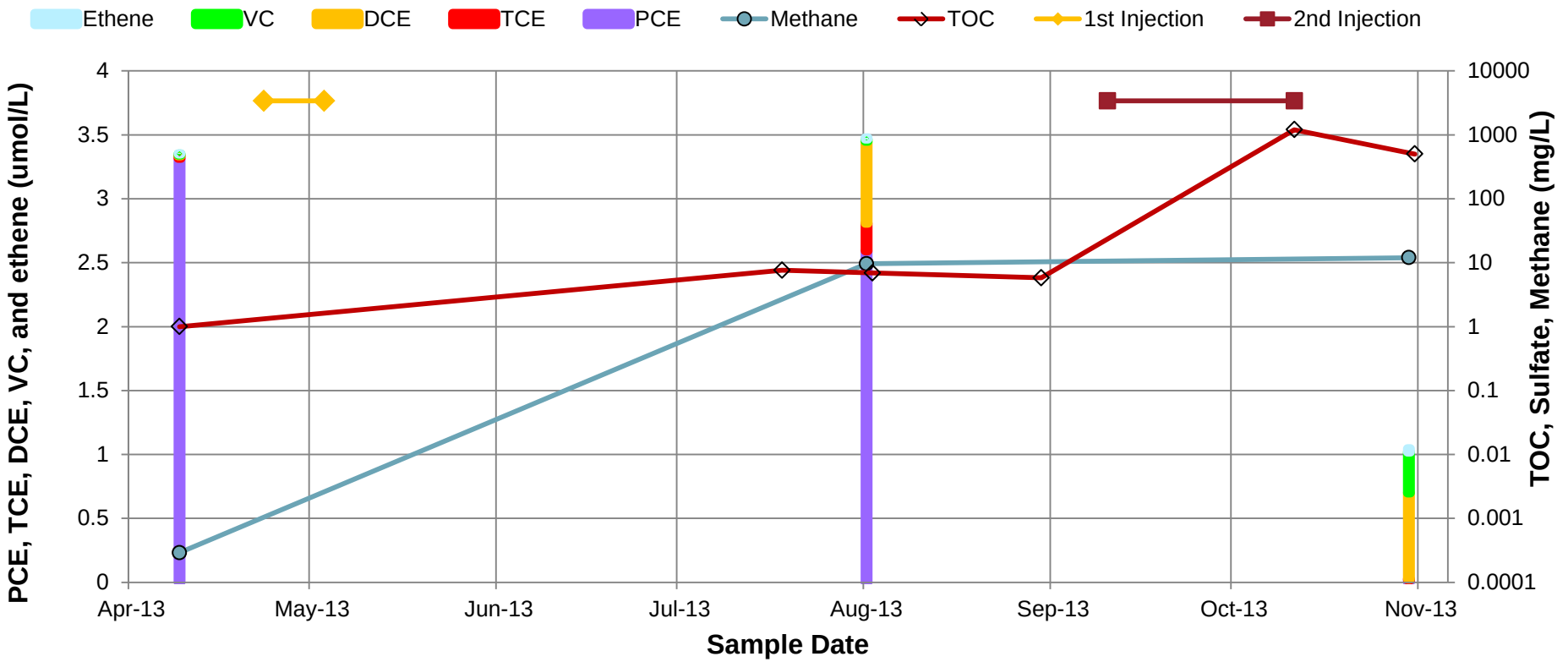
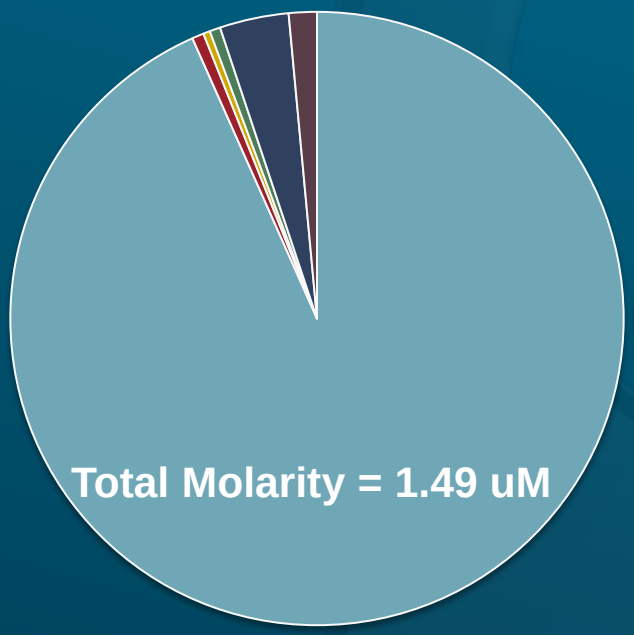

Field pH
1st Injection
Fluorescein
2nd Injection
Field pH (s.u.)
9.00
8.00
7.00
6.00
5.00
4.00
3.00
Fluorescein (ppb)
3500
3000
2500
2000
1500
1000
500
0
Apr-13
May-13
Jun-13
Jul-13
Aug-13
Aug-13
Oct-13
Oct-13

MW-3

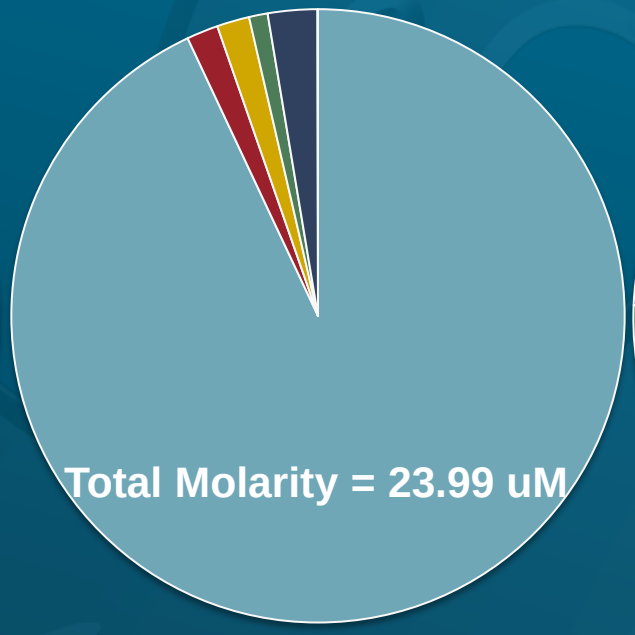

Ethene
VC
DCE
TCE
PCE
Methane
TOC
1st Injection
2nd Injection
PCE, TCE, DCE, VC, and ethene (umol/L)
4
3.5
3
2.5
2
1.5
1
0.5
0
TOC, Sulfate, Methane (mg/L)
10000
1000
100
10
1
0.1
0.01
0.001
0.0001
Apr-13
May-13
Jun-13
Jul-13
Aug-13
Sep-13
Oct-13
Nov-13
Sample Date

MW-3R

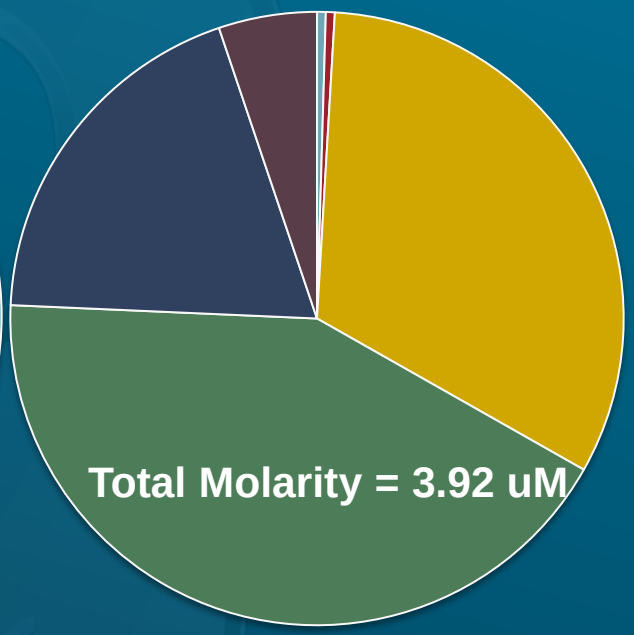
PCE TCE cisDCE VC Ethene Ethane



Baseline



Post 1st Injection



Post 2nd Injection

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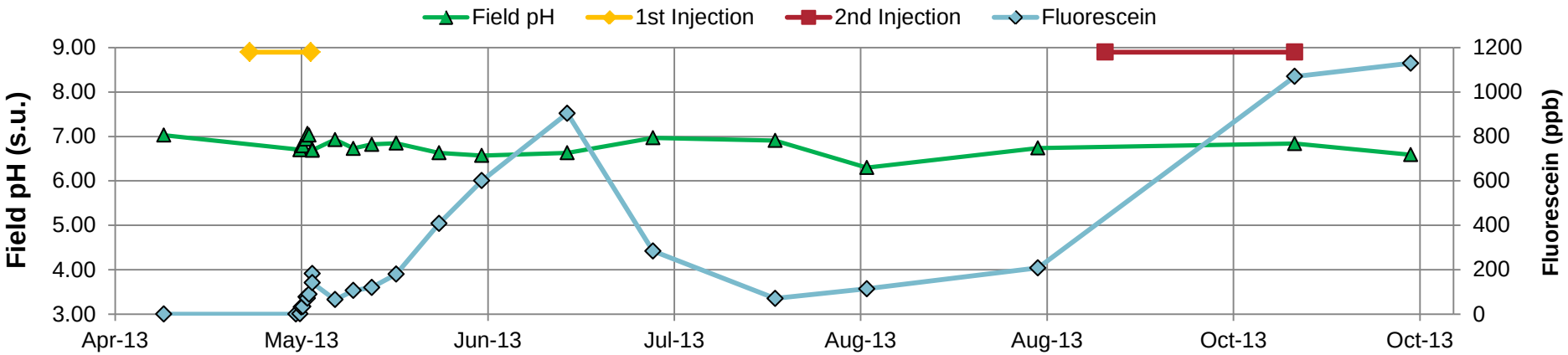
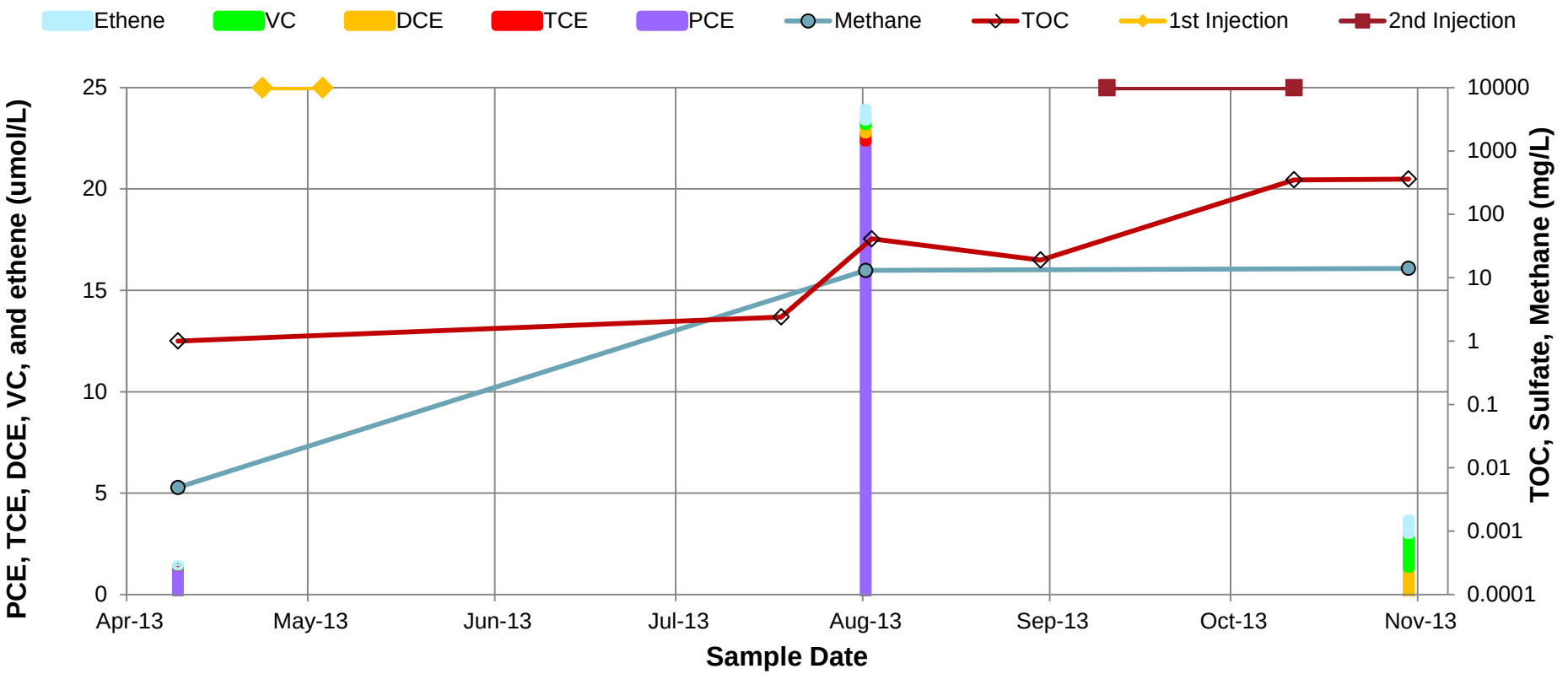
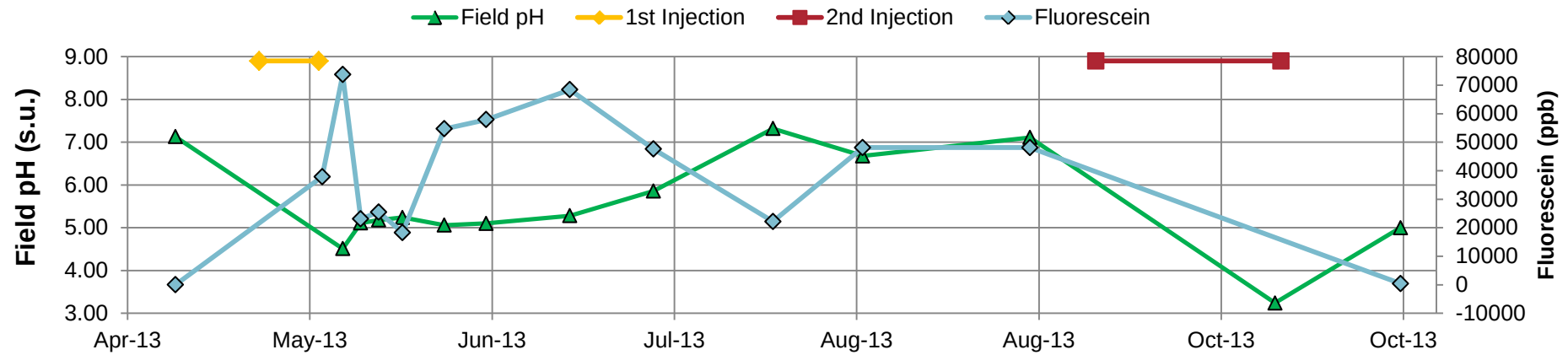
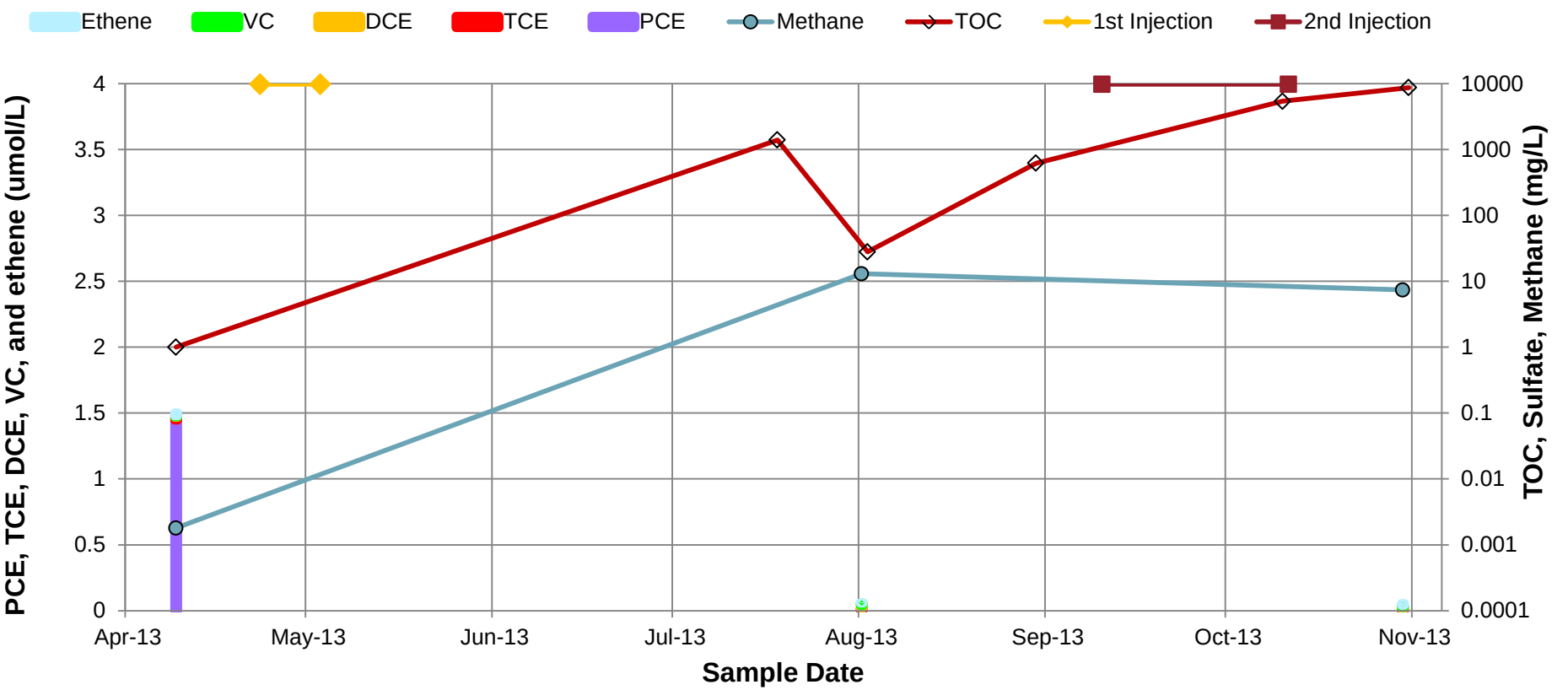

Field pH
1st Injection
2nd Injection
Fluorescein
Field pH (s.u.)
Fluorescein (ppb)
9.00
8.00
7.00
6.00
5.00
4.00
3.00
1200
1000
800
600
400
200
0
Apr-13
May-13
Jun-13
Jul-13
Aug-13
Aug-13
Oct-13
Oct-13

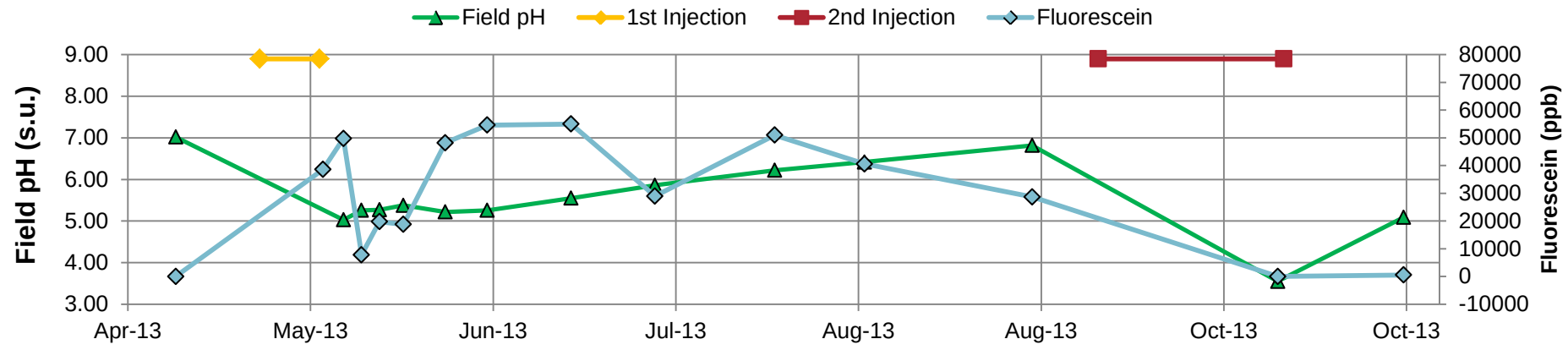
MW-3R


Ethene
VC
DCE
TCE
PCE
Methane
TOC
1st Injection
2nd Injection
PCE, TCE, DCE, VC, and ethene (umol/L)
TOC, Sulfate, Methane (mg/L)
25
20
15
10
5
0
10000
1000
100
10
1
0.1
0.01
0.001
0.0001
Apr-13
May-13
Jun-13
Jul-13
Aug-13
Sep-13
Oct-13
Nov-13
Sample Date

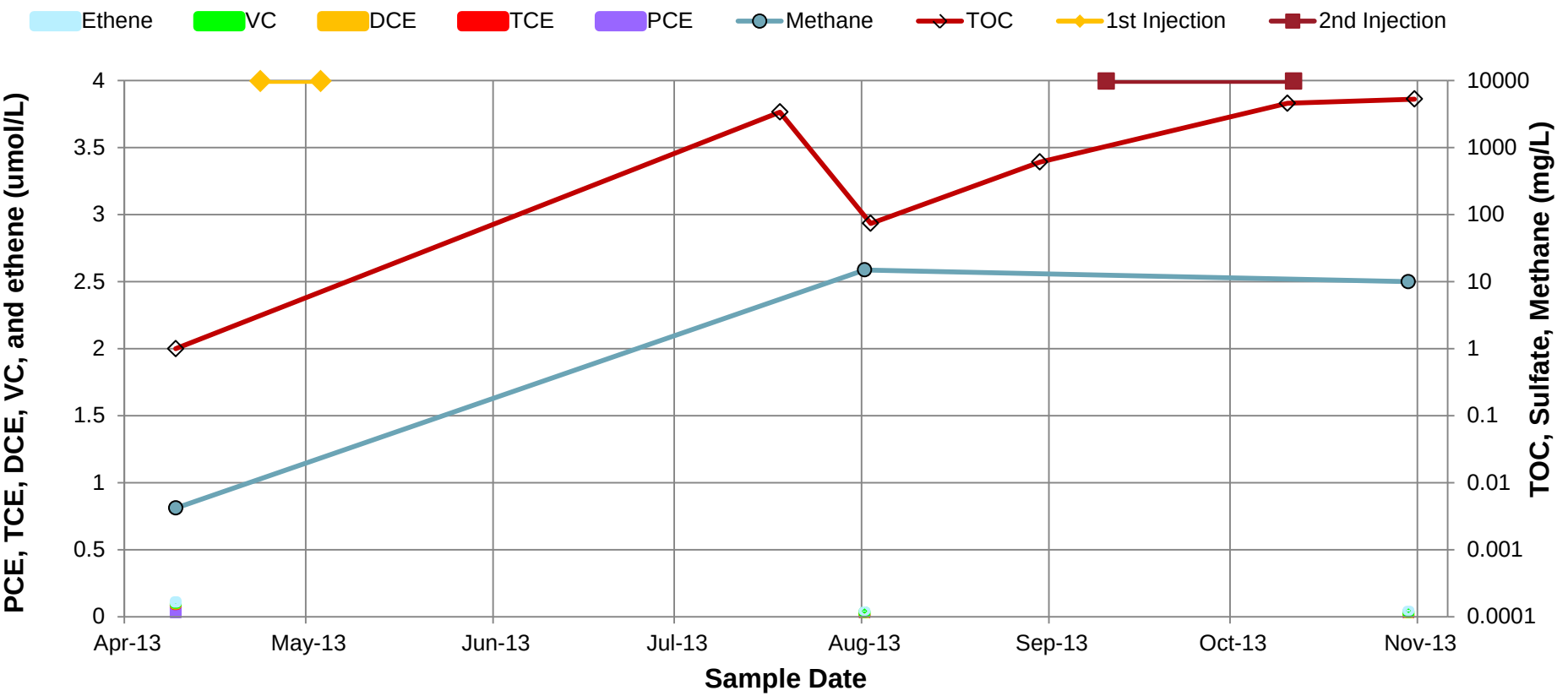

Field pH
1st Injection
2nd Injection
Fluorescein
Field pH (s.u.)
Fluorescein (ppb)
9.00
8.00
7.00
6.00
5.00
4.00
3.00
80000
70000
60000
50000
40000
30000
20000
10000
0
-10000
Apr-13
May-13
Jun-13
Jul-13
Aug-13
Aug-13
Oct-13
Oct-13

IW-1S


Ethene
VC
DCE
TCE
PCE
Methane
TOC
1st Injection
2nd Injection
PCE, TCE, DCE, VC, and ethene (umol/L)
TOC, Sulfate, Methane (mg/L)
4
3.5
3
2.5
2
1.5
1
0.5
0
10000
1000
100
10
1
0.1
0.01
0.001
0.0001
Apr-13
May-13
Jun-13
Jul-13
Aug-13
Sep-13
Oct-13
Nov-13
Sample Date


Field pH
1st Injection
2nd Injection
Fluorescein
Field pH (s.u.)
Fluorescein (ppb)
9.00
8.00
7.00
6.00
5.00
4.00
3.00
80000
70000
60000
50000
40000
30000
20000
10000
0
-10000
Apr-13
May-13
Jun-13
Jul-13
Aug-13
Aug-13
Oct-13
Oct-13

IW-1D


Ethene
VC
DCE
TCE
PCE
Methane
TOC
1st Injection
2nd Injection
PCE, TCE, DCE, VC, and ethene (umol/L)
TOC, Sulfate, Methane (mg/L)
4
3.5
3
2.5
2
1.5
1
0.5
0
10000
1000
100
10
1
0.1
0.01
0.001
0.0001
Apr-13
May-13
Jun-13
Jul-13
Aug-13
Sep-13
Oct-13
Nov-13
Sample Date

Groundwater Velocity – Tracer Data

Date	Elapsed Time (d)	IW-1S (ug/L)	IW-1D (ug/L)	MW-3 (ug/L)	MW-3R (ug/L)	MW-14 (ug/L)	MW-5 (ug/L)	MW-4 (ug/L)
5/3/13	0	37,900	38,600	27	141	NS	NS	NS
5/7/13	4	73,700	49,800	24	65	0	NS	NS
5/10/13	7	23,100	7,840	18	106	0	NS	NS
5/13/13	10	25,500	19,800	17	120	0	NS	NS
5/17/13	14	18,300	18,800	37	180	0.015	NS	NS
5/24/13	21	54,700	48,200	0	408	0	NS	NS
5/31/13	28	57,900	54,600	14	601	0.015	NS	NS
6/14/13	42	68,400	55,000	14	904	0	NS	0
6/28/13	56	47,600	29,000	32	284	0	0	0
7/18/13	76	22,200	51,000	42	70	0	0	0
8/2/13	91	48,100	40,600	72	114	0	0	0
10/11/13	161	0	28.7	3,440	1,070	0.012	0	0
10/30/13	180	394	565	2,370	1,130	0.021	0	0

2nd Injection of 2% molasses

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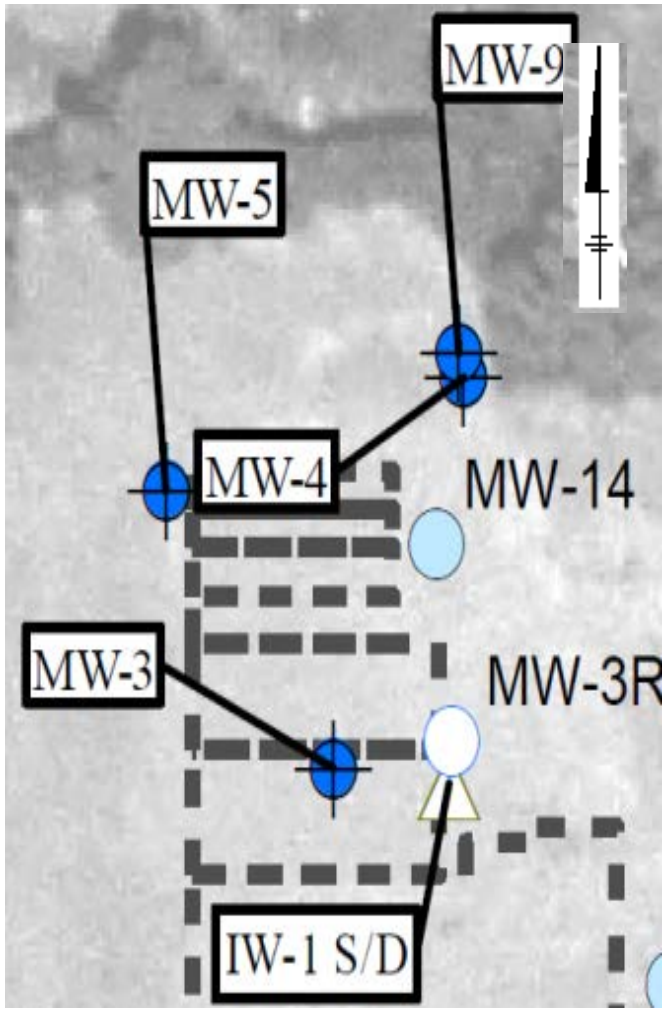
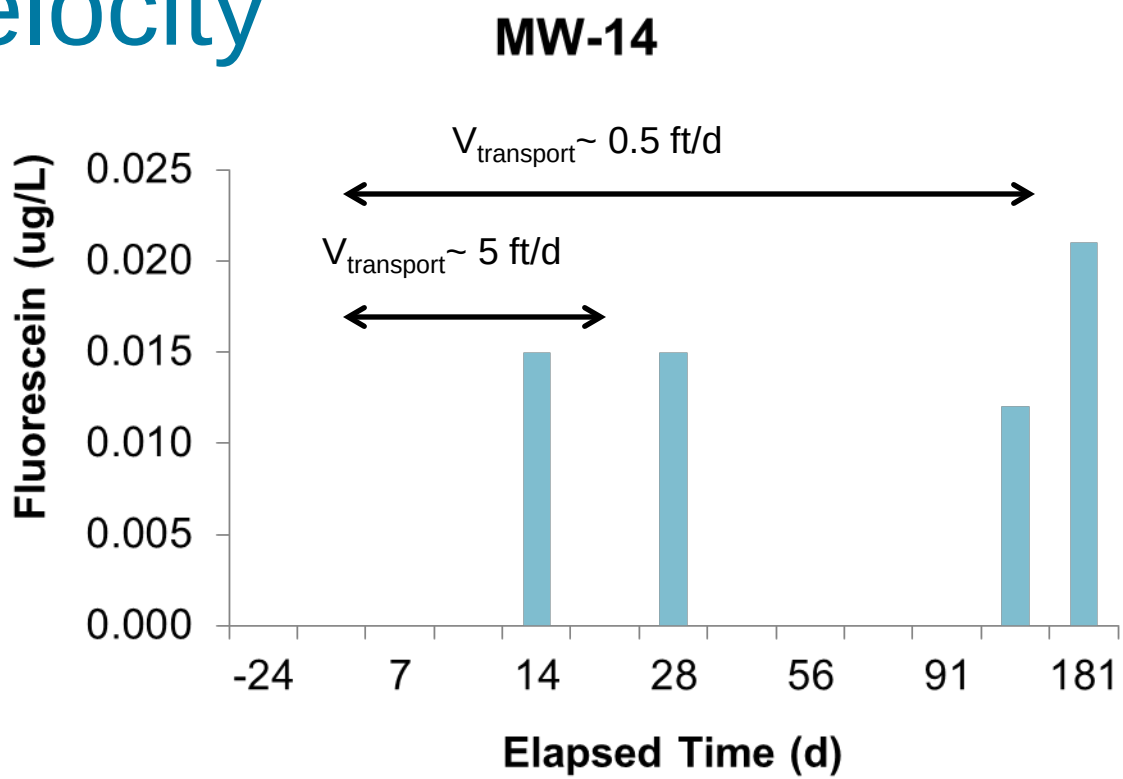
Groundwater Velocity





- Dye tracer appears to be arriving at MW-14 (approximately 100 ft downgradient)
- Flow direction due north (no detections at MW-4)

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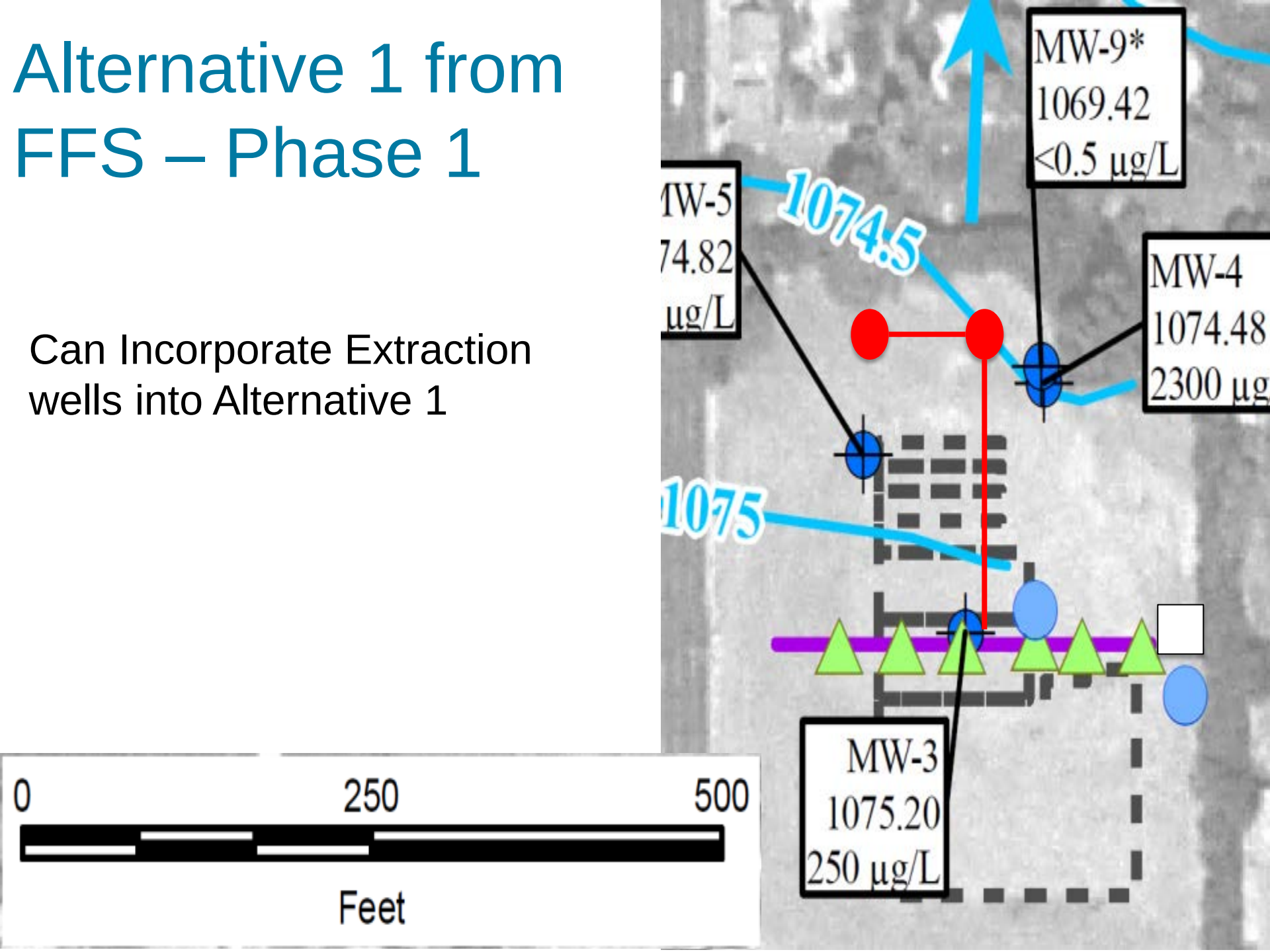
Alternative 1 from FFS – Phase 1

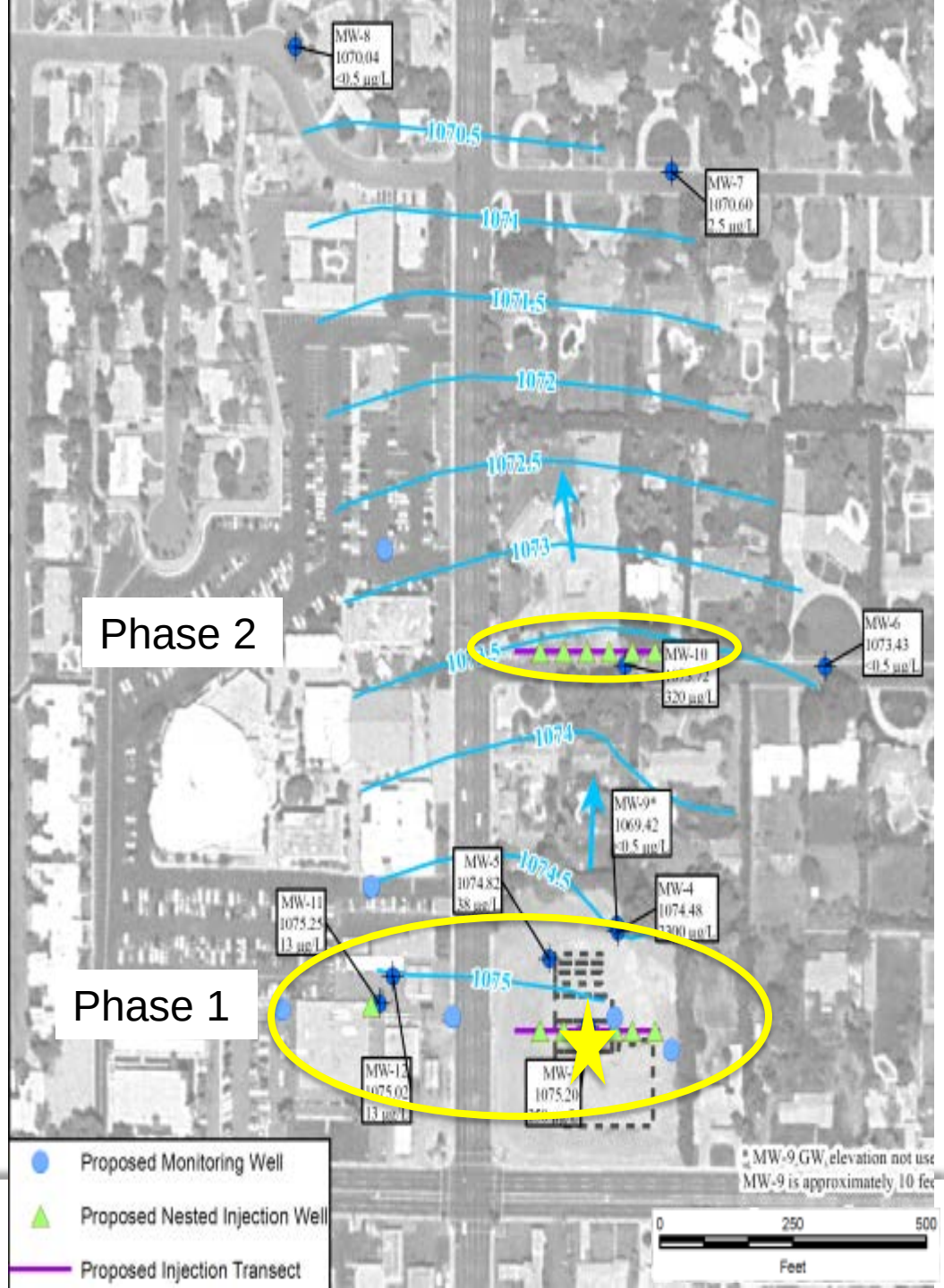
Can Incorporate Extraction wells into Alternative 1



Alternative 1 from FFS

- Implement Alternative 1 in phases
  - Phase 1, vacant lot and Former Dry Cleaner across 7th Avenue
  - Phase 2 downgradient

Location of Pilot



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Questions?

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