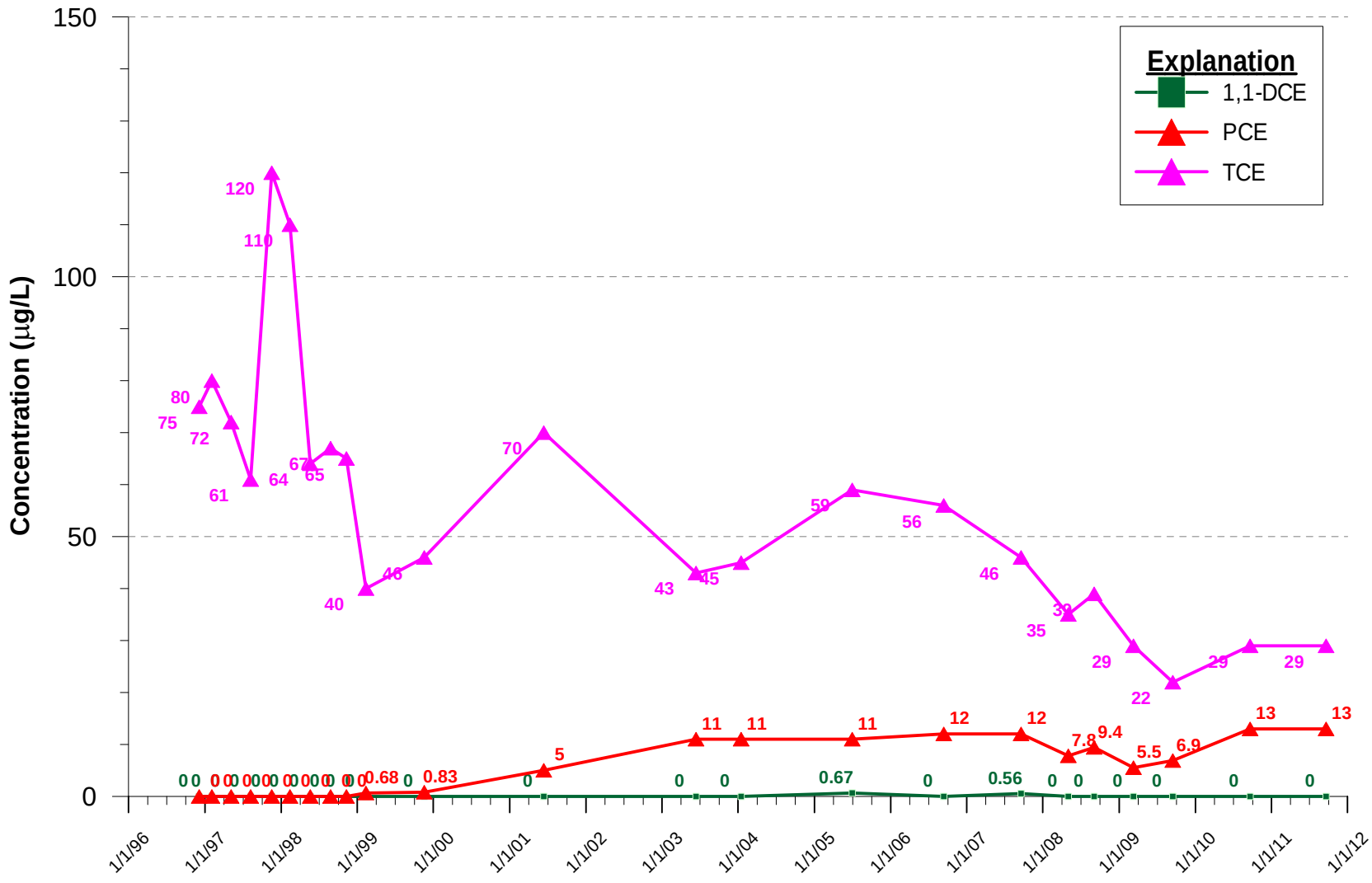
APPENDIX A

Time Series Plots – WOC LSGS Wells

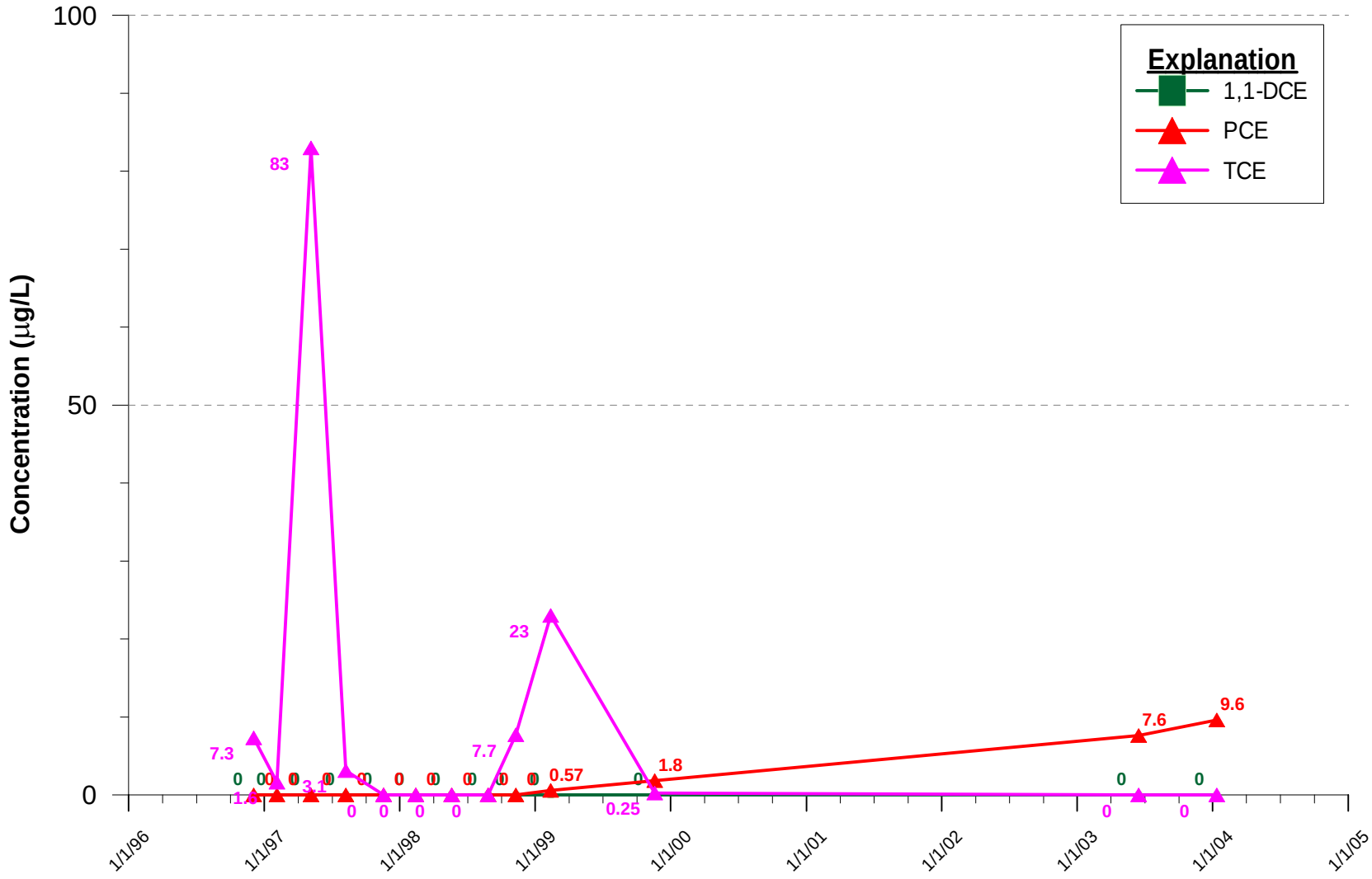


TITLE:	MW-2M COC Concentrations vs. Time
CLIENT:	West Osborn Complex WQARF Site, Phoenix, Arizona

GeoTrans, Inc.

CHECKED	JZ
DRAFTED	TD
PROJECT	2209.003
DATE	03/08/12

CHART: **A-1**



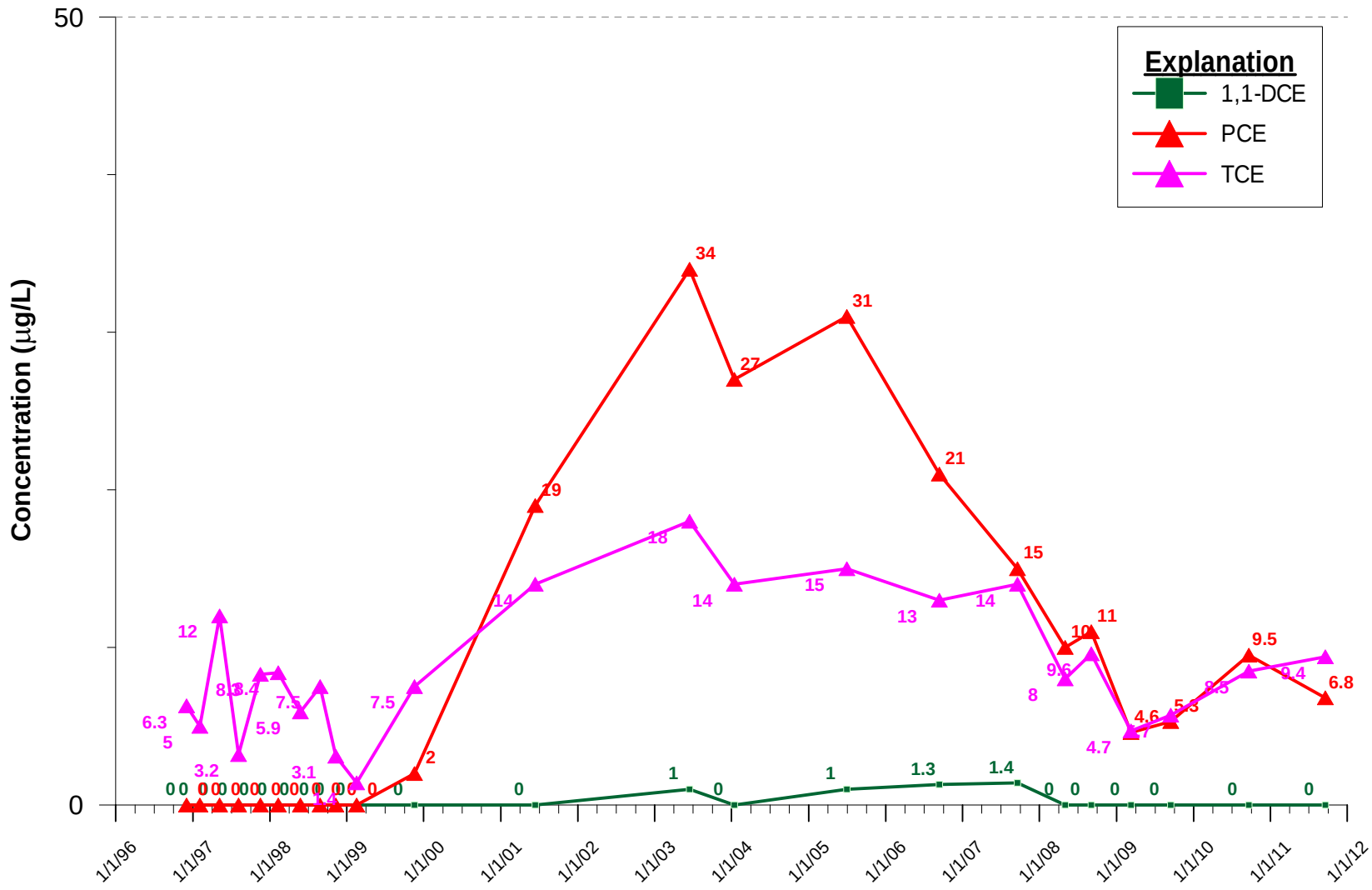
TITLE: MW-3M COC Concentrations vs. Time

CLIENT: West Osborn Complex WQARF Site, Phoenix, Arizona

GeoTrans, Inc.

CHECKED	JZ
DRAFTED	TD
PROJECT	2209.003
DATE	03/08/12

CHART: A-2

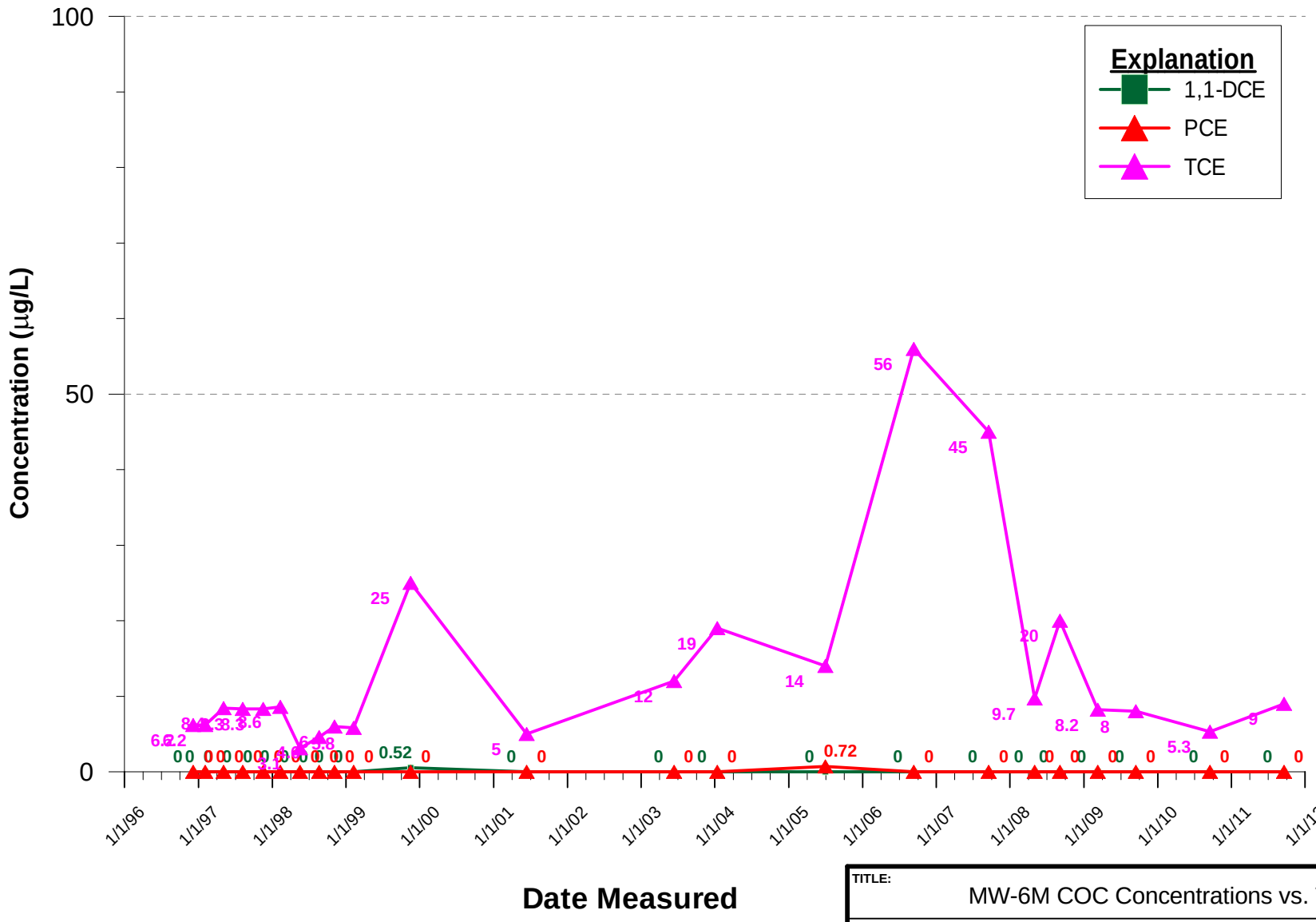


TITLE:	MW-4M COC Concentrations vs. Time
CLIENT:	West Osborn Complex WQARF Site, Phoenix, Arizona

GeoTrans, Inc.

CHECKED	JZ
DRAFTED	TD
PROJECT	2209.003
DATE	03/08/12

CHART: A-3

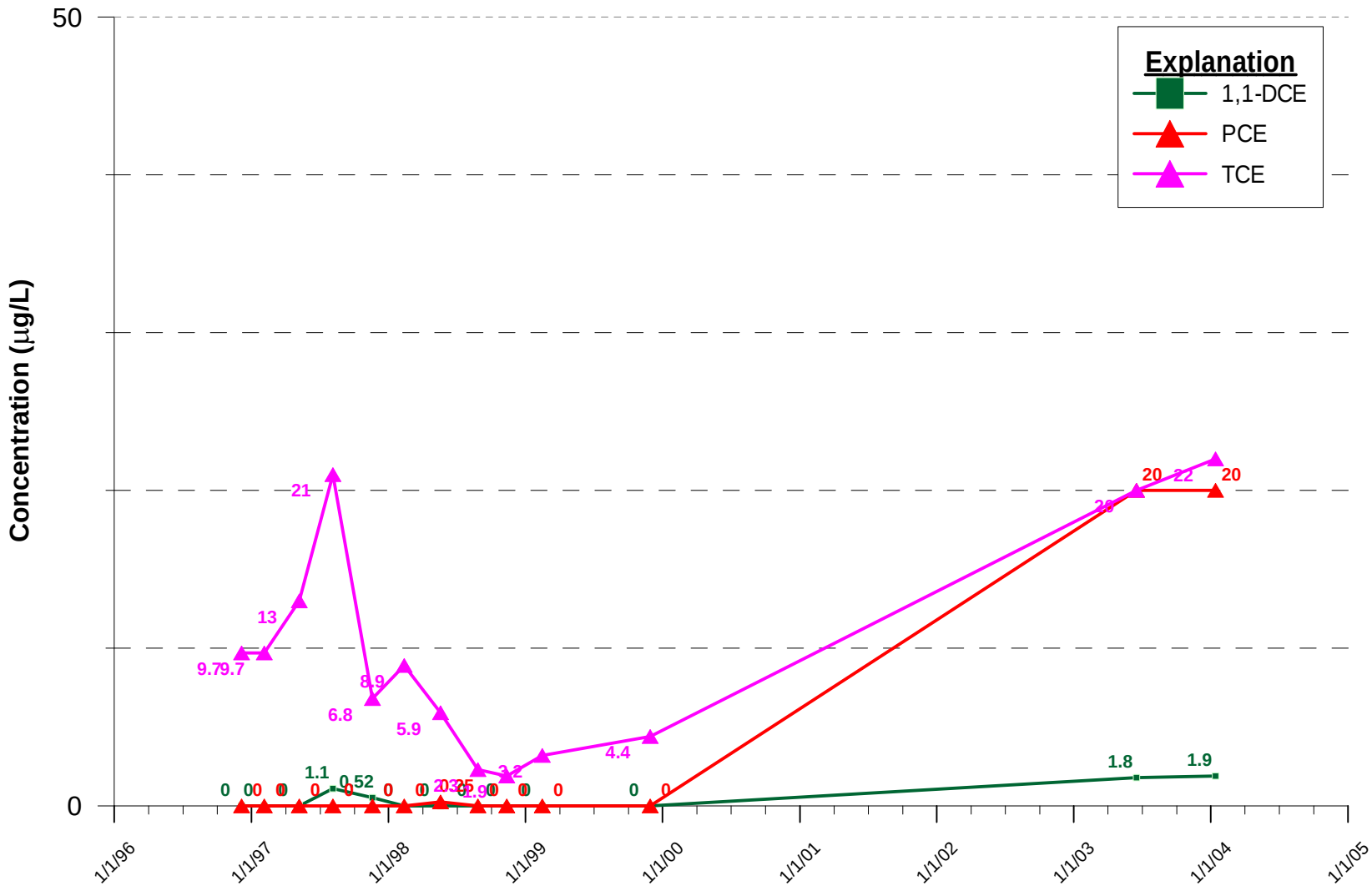


TITLE:	MW-6M COC Concentrations vs. Time
CLIENT:	West Osborn Complex WQARF Site, Phoenix, Arizona

GeoTrans, Inc.

CHECKED	JZ
DRAFTED	TD
PROJECT	2209.003
DATE	03/08/12

CHART: A-4

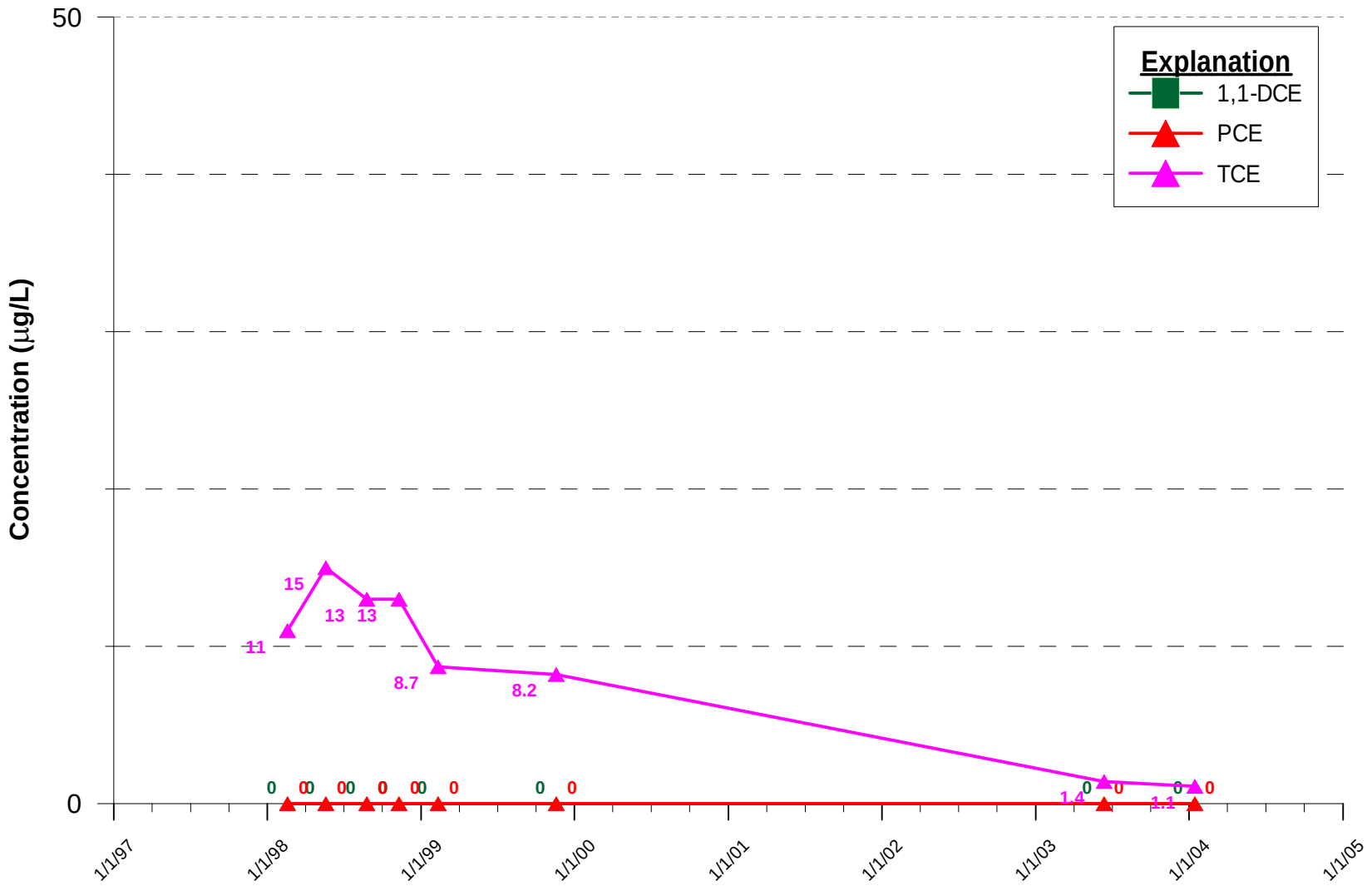


TITLE:	MW-7M COC Concentrations vs. Time
CLIENT:	West Osborn Complex WQARF Site, Phoenix, Arizona

GeoTrans, Inc.

CHECKED	JZ
DRAFTED	TD
PROJECT	2209.003
DATE	03/08/12

CHART: A-5

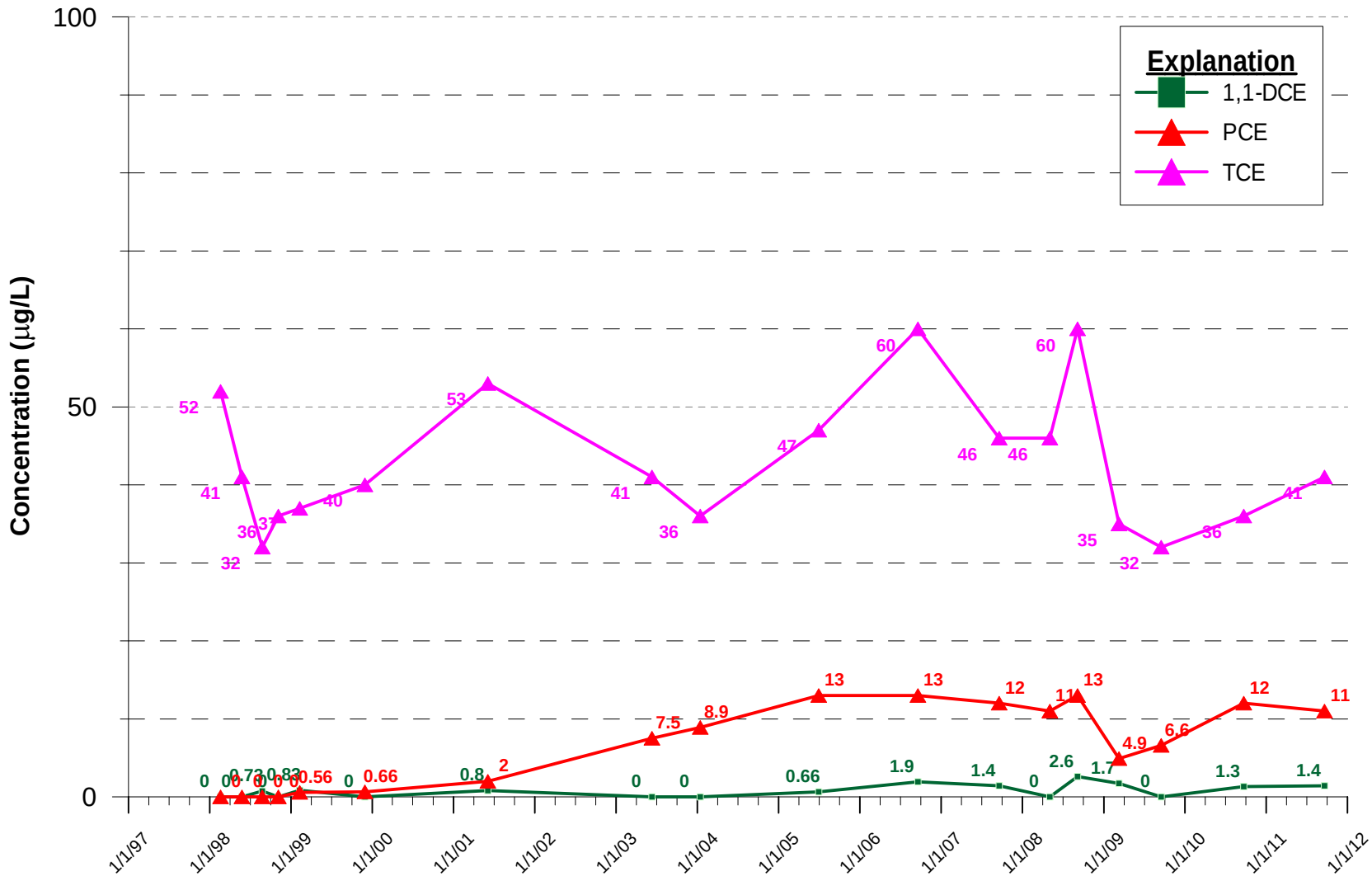


TITLE:	MW-102M COC Concentrations vs. Time
CLIENT:	West Osborn Complex WQARF Site, Phoenix, Arizona

GeoTrans, Inc.

CHECKED	JZ
DRAFTED	TD
PROJECT	2209.003
DATE	03/08/12

CHART: A-6

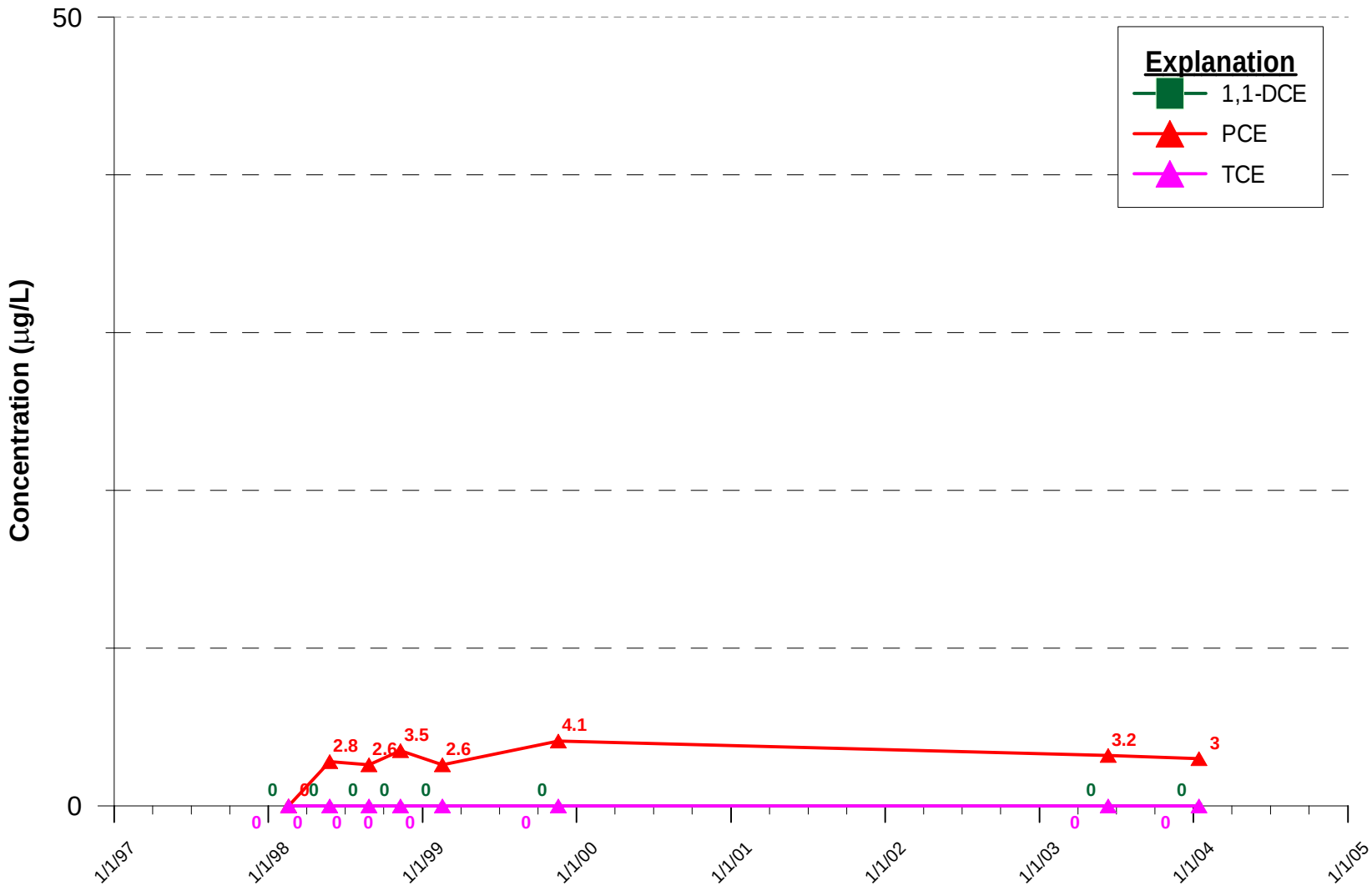


TITLE:	MW-105M COC Concentrations vs. Time
CLIENT:	West Osborn Complex WQARF Site, Phoenix, Arizona

GeoTrans, Inc.

CHECKED	JZ
DRAFTED	TD
PROJECT	2209.003
DATE	03/08/12

CHART: A-7

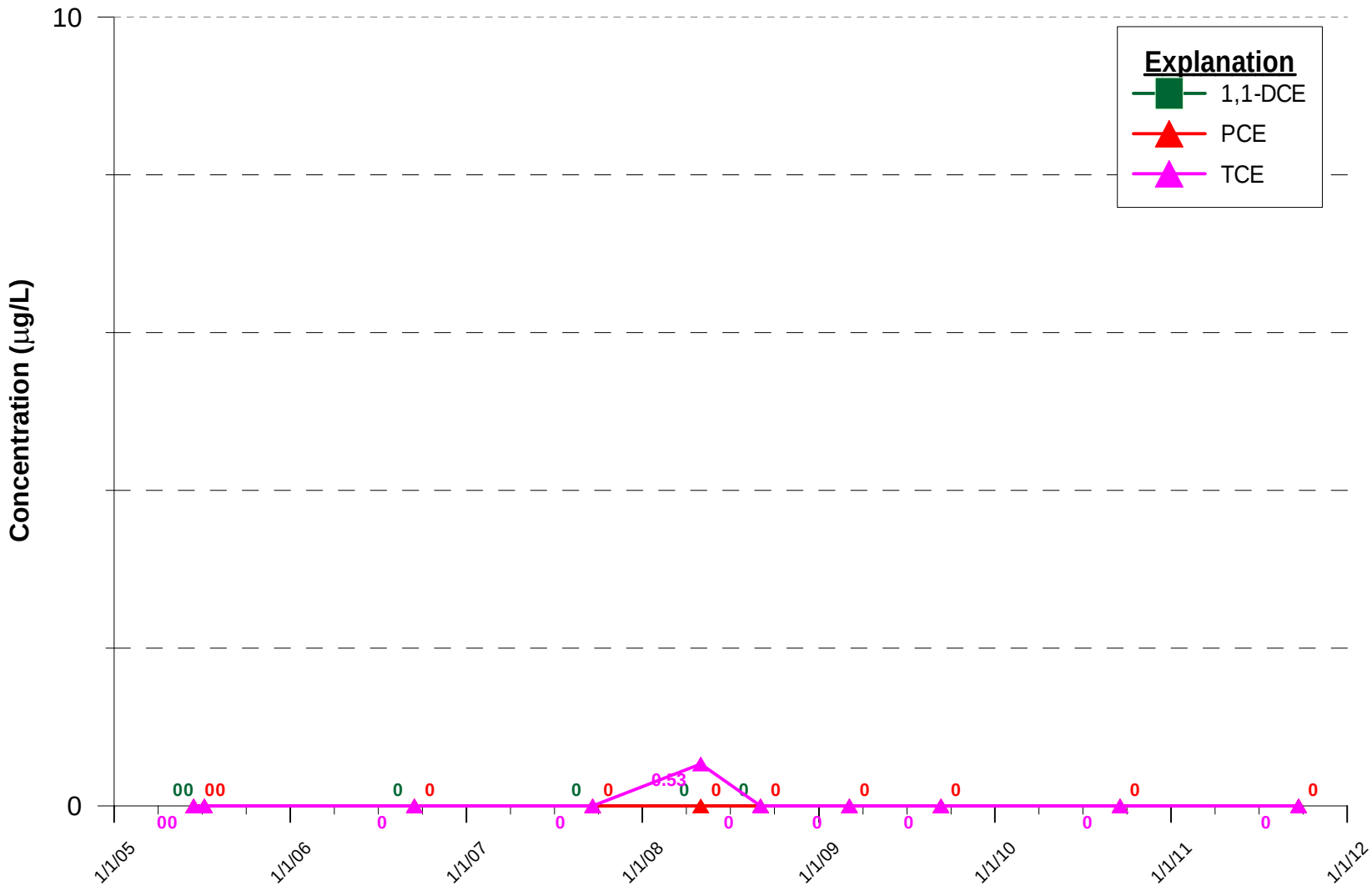


TITLE:	MW-106M COC Concentrations vs. Time
CLIENT:	West Osborn Complex WQARF Site, Phoenix, Arizona

GeoTrans, Inc.

CHECKED	JZ
DRAFTED	TD
PROJECT	2209.003
DATE	03/08/12

CHART: A-8



TITLE:	MW-203M COC Concentrations vs. Time
CLIENT:	West Osborn Complex WQARF Site, Phoenix, Arizona

GeoTrans, Inc.

CHECKED	JZ
DRAFTED	TD
PROJECT	2209.003
DATE	03/08/12

CHART: A-9

APPENDIX B

Vendor Modeling Results for Liquid GAC and Air Stripping

Air stripping w/VGAC, 500 gPM

PROMINENT
SYSTEMS INC
13095 E. Temple Avenue, Industry CA 91746
Phone: 626.858.1888 Facsimile: 626.858.1888

Client: Rackow, P.E. , Tetra Tech, Inc.
Report Date: 2/13/2012 9:10:15 AM

VAPOR PHASE ISOTHERM REPORT

Influent Conditions

Flowrate (SFCM)	3500.0	**Flowrate (ACFM)**	2733.6
Temperature (F)	68.0	**Temperature (R)**	527.7
Pressure (PSIG)	4.500	**Pressure (PSIA)**	19.2
Relative Humidity (%)	50.0	**Site Elevation (FT)**	Sea Level

Adsorbate	Concentration mg/m3	% Loading (lb VOC /lb GAC)	Mass Flowrate (lbs VOC / Day)	GAC Usage Rate (lbs GAC / Day)
Trichloroethene	1.25	0.038520	0.39290	10.200
Tetrachloroethene	0.30	0.095522	0.09430	0.987
1,1-Dichloroethene	0.10	0.002750	0.03143	11.430
				22.617
			(Total Activated Carbon Usage Rate Mulitiplied by 1.85)	
Estimated Activated Carbon Usage Rate (Lbs Carbon / Day)			41.84	

22.617 x 1.75 = 39.58 lbs/day VGAC

Note: Standard Temperature 60°F, and Standard Pressure 14.7-PSIA

Activated Carbon Usage Rates have been estimated using Prominent Systems, Inc.'s proprietary predictive software based upon empirical and predictive modeling. Actual Activated Carbon Usage Rates may differ from this estimate due to fluctuating influent concentrations, background compounds not included in this report, along with many other factors. No expressed or implied warranty in regards to the applicability or suitability of the information contained in this report.

VAPOR PHASE ISOTHERM DESIGN PARAMETERS

System Temperature	69.00000 °F
Air Flow Rate	3500.00000 SCFM
System Pressure	14.70000 psi
Relative Humidity	50.0000 %

VAPOR PHASE DESIGN

Component Name	Concentration	#GAC/day at Breakthrough
ETHENE,TRICHLORO- (TCE)	1.2500 mg/m³	16.6950
ETHENE,TETRACHLORO- (PCE)	0.3000 mg/m³	1.9849
ETHENE,1,1-DICHLORO-	0.1000 mg/m³	20.5264

Total Carbon Usage Estimated at Breakthrough

39.2063 #GAC/day

Air Stripping w/ VGAC, 500 gpm:

39.2063 x 1.75 = 68.61 lbs/day
VGAC use

* indicates that Relative Humidity was calculated

~ indicates that Relative Humidity was approximated

The above carbon usage estimates are based on both experimental data as well as predictive models. Actual carbon usage rates observed at various stages of breakthrough depend on many factors, and may therefore differ from the above estimates. Please contact Westates Carbon Products for further assisitance.

PROMINENT
SYSTEMS INC
13095 E. Temple Avenue, Industry CA 91746
Phone: 626.858.1888 Facsimile: 626.858.1888

Client: Rackow, P.E. , Tetra Tech, Inc.
Report Date: 2/13/2012 9:11:19 AM

Air stripping w/VGAC, 750 gpm

VAPOR PHASE ISOTHERM REPORT

Influent Conditions

Flowrate (SFCM)	3500.0	**Flowrate (ACFM)**	2733.6
Temperature (F)	68.0	**Temperature (R)**	527.7
Pressure (PSIG)	4.500	**Pressure (PSIA)**	19.2
Relative Humidity (%)	50.0	**Site Elevation (FT)**	Sea Level

Adsorbate	Concentration	% Loading	Mass Flowrate	GAC Usage Rate
	mg/m3	(lb VOC /lb GAC)	(lbs VOC / Day)	(lbs GAC / Day)
Trichloroethene	2.00	0.046657	0.62865	13.474
Tetrachloroethene	0.50	0.111430	0.15716	1.410
1,1-Dichloroethene	0.15	0.003509	0.04715	13.435
				28.319
			(Total Activated Carbon	
			Usage Rate Mulitiplied by 1.85)	

Estimated Activated Carbon Usage Rate (Lbs Carbon / Day) 52.39

28.319 x 1.75 = 49.56 lbs/day
VGAC use

Note: Standard Temperature 60°F, and Standard Pressure 14.7-PSIA

Activated Carbon Usage Rates have been estimated using Prominent Systems, Inc.'s proprietary predictive software based upon empirical and predictive modeling. Actual Activated Carbon Usage Rates may differ from this estimate due to fluctuating influent concentrations, background compounds not included in this report, along with many other factors. No expressed or implied warranty in regards to the applicability or suitability of the information contained in this report.

VAPOR PHASE ISOTHERM DESIGN PARAMETERS

System Temperature	69.00000 °F
Air Flow Rate	3500.00000 SCFM
System Pressure	14.70000 psi
Relative Humidity	50.0000 %

VAPOR PHASE DESIGN

Component Name	Concentration	#GAC/day at Breakthrough
ETHENE,TRICHLORO- (TCE)	2.0000 mg/m³	21.9847
ETHENE,TETRACHLORO- (PCE)	0.5000 mg/m³	2.8180
ETHENE,1,1-DICHLORO-	0.1500 mg/m³	24.4318

Total Carbon Usage Estimated at Breakthrough

49.2345 #GAC/day

Air Stripping w/ VGAC, 750 gpm:

49.2345 × 1.75 = 86.16 lbs/day VGAC

* indicates that Relative Humidity was calculated

~ indicates that Relative Humidity was approximated

The above carbon usage estimates are based on both experimental data as well as predictive models. Actual carbon usage rates observed at various stages of breakthrough depend on many factors, and may therefore differ from the above estimates. Please contact Westates Carbon Products for further assisitance.

PROMINENT
SYSTEMS INC
13095 E. Temple Avenue, Industry CA 91746
Phone: 626.858.1888 Facsimile: 626.858.1888

Air stripping w/ LGAC, 500 gpm

Client: Mr. Jeff W. Rackow, P.E. , Tetra Tech, Inc.
Report Date: 2/13/2012 8:42:29 AM

LIQUID PHASE ISOTHERM REPORT

Influent Conditions

Flowrate (GPM)	500.0	**Operating Hrs/Day**	24.0
Temperature (F)	68.0	**Temperature (R)**	527.7
Pressure (PSIG)	100.000	**Pressure (PSIA)**	114.7

Adsorbate	Concentration ug/L	% Loading (lb VOC /lb GAC)	Mass Flowrate (lbs VOC / Day)	GAC Usage Rate (lbs GAC / Day)
Trichloroethene	0.500	0.0028	0.0030	1.071
Tetrachloroethene	0.250	0.0065	0.0015	0.231
1,1-Dichloroethene	0.125	0.00006	0.0007	12.495
				13.797
			(Total Activated Carbon Usage Rate Mulitiplied by 1.85)	

Estimated Activated Carbon Usage Rate (Lbs Carbon / Day) 25.52

13.797 lbs/day × 1.75 = 24.14 lbs/day
LGAC use

Activated Carbon Usage Rates have been estimated using Prominent Systems, Inc.'s proprietary predictive software based upon empirical and predictive modeling. Actual Activated Carbon Usage Rates may differ from this estimate due to fluctuating influent concentrations, background compounds not included in this report, along with many other factors. No expressed or implied warranty in regards to the applicability or suitability of the information contained in this report.

LIQUID PHASE ISOTHERM DESIGN PARAMETERS

Water Flow Rate 500.00000 gpm

LIQUID PHASE DESIGN

Component Name	*Concentration*	*#GAC/1000 gallons of water*
ETHENE,TRICHLORO- (TCE)	0.5000 ppbw	0.0050
ETHENE,TETRACHLORO- (PCE)	0.2500 ppbw	0.0019
ETHENE,1,1-DICHLORO-	0.1250 ppbw	0.0118

Total Carbon Usage Estimated at Breakthrough

13.5032 #GAC/day

0.0188 #GAC/1000 gallons of water

Air stripping w/ LGAC, 500 gpm:

13.5 lbs/day x 1.75 = 23.63 lbs/day LGAC use

The above carbon usage estimates are based on both experimental data as well as predictive models. Actual carbon usage rates observed at various stages of breakthrough depend on many factors, and may therefore differ from the above estimates. Please contact Westates Carbon Products for further assisitance.

PROMINENT
SYSTEMS INC
13095 E. Temple Avenue, Industry CA 91746
Phone: 626.858.1888 Facsimile: 626.858.1888

Air stripping w/ LGAC, 750 gpm

Client: Mr. Jeff W. Rackow, P.E. , Tetra Tech, Inc.
Report Date: 2/13/2012 8:43:30 AM

LIQUID PHASE ISOTHERM REPORT

Influent Conditions

Flowrate (GPM)	750.0	**Operating Hrs/Day**	24.0
Temperature (F)	68.0	**Temperature (R)**	527.7
Pressure (PSIG)	100.000	**Pressure (PSIA)**	114.7

Adsorbate	Concentration ug/L	% Loading (lb VOC /lb GAC)	Mass Flowrate (lbs VOC / Day)	GAC Usage Rate (lbs GAC / Day)
Trichloroethene	0.500	0.0028	0.0045	1.607
Tetrachloroethene	0.250	0.0065	0.0022	0.346
1,1-Dichloroethene	0.125	0.00006	0.0011	18.743
				20.695
			(Total Activated Carbon Usage Rate Mulitiplied by 1.85)	
Estimated Activated Carbon Usage Rate (Lbs Carbon / Day)			38.29	

20.695 lbs/day X 1.75 = 36.22 lbs/day
LGAC use

Activated Carbon Usage Rates have been estimated using Prominent Systems, Inc.'s proprietary predictive software based upon empirical and predictive modeling. Actual Activated Carbon Usage Rates may differ from this estimate due to fluctuating influent concentrations, background compounds not included in this report, along with many other factors. No expressed or implied warranty in regards to the applicability or suitability of the information contained in this report.

LIQUID PHASE ISOTHERM DESIGN PARAMETERS

Water Flow Rate 750.00000 gpm

LIQUID PHASE DESIGN

Component Name	*Concentration*	*#GAC/1000 gallons of water*
ETHENE,TRICHLORO- (TCE)	0.5000 ppbw	0.0050
ETHENE,TETRACHLORO- (PCE)	0.2500 ppbw	0.0019
ETHENE,1,1-DICHLORO-	0.1250 ppbw	0.0118

Total Carbon Usage Estimated at Breakthrough

20.2547 #GAC/day

0.0188 #GAC/1000 gallons of water

Air stripping w/ LGAC, 750 gpm:

20.255 x 1.75 = 35.45 lbs/day

LGAC use

The above carbon usage estimates are based on both experimental data as well as predictive models. Actual carbon usage rates observed at various stages of breakthrough depend on many factors, and may therefore differ from the above estimates. Please contact Westates Carbon Products for further assisitance.

PROMINENT
SYSTEMS INC
13095 E. Temple Avenue, Industry CA 91746
Phone: 626.858.1888 Facsimile: 626.858.1888

Client: Mr. Jeff W. Rackow, P.E. , Tetra Tech, Inc.
Report Date: 2/13/2012 8:35:31 AM

LGAC only
500 gpm

LIQUID PHASE ISOTHERM REPORT

Influent Conditions

Flowrate (GPM)	500.0	**Operating Hrs/Day**	24.0
Temperature (F)	68.0	**Temperature (R)**	527.7
Pressure (PSIG)	100.000	**Pressure (PSIA)**	114.7

Adsorbate	Concentration ug/L	% Loading (lb VOC /lb GAC)	Mass Flowrate (lbs VOC / Day)	GAC Usage Rate (lbs GAC / Day)
Trichloroethene	60.00	0.018	0.360	19.992
Tetrachloroethene	15.0	0.035	0.090	2.570
1,1-Dichloroethene	5.0	0.0005	0.030	64.132
				86.694
			(Total Activated Carbon Usage Rate Mulitiplied by 1.85)	

Estimated Activated Carbon Usage Rate (Lbs Carbon / Day) 160.38

86.694 x 1.75 = 151.7 lbs/day
LGAC use

Activated Carbon Usage Rates have been estimated using Prominent Systems, Inc.'s proprietary predictive software based upon empirical and predictive modeling. Actual Activated Carbon Usage Rates may differ from this estimate due to fluctuating influent concentrations, background compounds not included in this report, along with many other factors. No expressed or implied warranty in regards to the applicability or suitability of the information contained in this report.

LIQUID PHASE ISOTHERM DESIGN PARAMETERS

Water Flow Rate 500.00000 gpm

LIQUID PHASE DESIGN

Component Name	*Concentration*	*#GAC/1000 gallons of water*
ETHENE,TRICHLORO- (TCE)	60.0000 ppbw	0.0605
ETHENE,TETRACHLORO- (PCE)	15.0000 ppbw	0.0136
ETHENE,1,1-DICHLORO-	5.0000 ppbw	0.0695

Total Carbon Usage Estimated at Breakthrough

103.3857 #GAC/day

0.1436 #GAC/1000 gallons of water

LGAC only, 500 gpm:

103.3857 x 1.75 = 180.92 lbs/day

The above carbon usage estimates are based on both experimental data as well as predictive models. Actual carbon usage rates observed at various stages of breakthrough depend on many factors, and may therefore differ from the above estimates. Please contact Westates Carbon Products for further assisitance.

PROMINENT
SYSTEMS INC
13095 E. Temple Avenue, Industry CA 91746
Phone: 626.858.1888 Facsimile: 626.858.1888

LGAC only, 750 gpm

Client: Mr. Jeff W. Rackow, P.E. , Tetra Tech, Inc.
Report Date: 2/13/2012 8:37:36 AM

LIQUID PHASE ISOTHERM REPORT

Influent Conditions

Flowrate (GPM)	750.0	**Operating Hrs/Day**	24.0
Temperature (F)	68.0	**Temperature (R)**	527.7
Pressure (PSIG)	100.000	**Pressure (PSIA)**	114.7

Adsorbate	Concentration ug/L	% Loading (lb VOC /lb GAC)	Mass Flowrate (lbs VOC / Day)	GAC Usage Rate (lbs GAC / Day)
Trichloroethene	60.00	0.018	0.540	29.988
Tetrachloroethene	15.0	0.035	0.135	3.856
1,1-Dichloroethene	5.0	0.0005	0.045	96.198
				130.041
			(Total Activated Carbon Usage Rate Mulitiplied by 1.85)	
Estimated Activated Carbon Usage Rate (Lbs Carbon / Day)			240.58	

130.041 X 1.75 = 227.57 lbs/day
LGAC use

Activated Carbon Usage Rates have been estimated using Prominent Systems, Inc.'s proprietary predictive software based upon empirical and predictive modeling. Actual Activated Carbon Usage Rates may differ from this estimate due to fluctuating influent concentrations, background compounds not included in this report, along with many other factors. No expressed or implied warranty in regards to the applicability or suitability of the information contained in this report.

LIQUID PHASE ISOTHERM DESIGN PARAMETERS

Water Flow Rate 750.00000 gpm

LIQUID PHASE DESIGN

Component Name	*Concentration*	*#GAC/1000 gallons of water*
ETHENE,TRICHLORO- (TCE)	60.0000 ppbw	0.0605
ETHENE,TETRACHLORO- (PCE)	15.0000 ppbw	0.0136
ETHENE,1,1-DICHLORO-	5.0000 ppbw	0.0695

Total Carbon Usage Estimated at Breakthrough

155.0786 #GAC/day

0.1436 #GAC/1000 gallons of water

LGAC only, 750 gpm:

155.08 x 1.75 = 271.39 lbs/day

LGAC use

The above carbon usage estimates are based on both experimental data as well as predictive models. Actual carbon usage rates observed at various stages of breakthrough depend on many factors, and may therefore differ from the above estimates. Please contact Westates Carbon Products for further assisitance.

CARBONAIR

Your Mobile Water Treatment Specialists

7500 Boone Ave N, Suite 101, Brooklyn Park, MN 55428 Ph: 800-526-4999 Fax: 763-315-4614 www.carbonair.com

Customer: GeoTrans, Phoenix, AZ
Site: Phoenix, AZ – (Scenario # 3 – 750 gpm)
Date: 3/28/08

Design Basis:

Flow rate:	750	gpm
Water temperature:	58	°F
Air temperature:	35	°F

Contaminant	Influent Conc. (ppb)	Effluent Criteria (ppb)
TCE	60	3
PCE	15	3
1,1-DCE	5	3

Recommendations:

Option # 1: Liquid Phase Carbon Adsorbers

Four PC78's (20,000 lbs of granular activated carbon each) arranged in two parallel trains of two adsorbers in series

- 1,1-DCE is the critical contaminant.
- The lead and lag vessels are predicted to last 200 and 450 days, respectively. Recommend changing out the lead vessel every 250 days.

Option # 2: Low Profile Air Stripper and Vapor-Phase Carbon Adsorbers

Low Profile Air Stripper:
STAT 720 with 4 trays, 3,500 cfm

- TCE is the critical contaminant.

Vapor Phase Carbon Adsorbers:
One GPC50R with 5,000 lbs of carbon

- TCE is the design contaminant.
- 1,1-DCE, which is not effectively removed by vapor-phase carbon adsorption, will be allowed to pass through the carbon adsorber at an emission rate of 0.0442 lbs/day.
- The carbon usage rate is predicted to be 27.010 lbs/day.
- The carbon adsorber is predicted to last 185 days.

LIQUID-PHASE CARBON ADSORPTION MODEL CALCULATIONS

CARBONAIR ENVIRONMENTAL SYSTEMS
7500 BOONE AVENUE NORTH, SUITE 101
BROOKLYN PARK, MN 55428
PHONE: 800-526-4999
FAX: 763-315-4614

CARBON ADSORBERS:	PC78
NO OF ADSORBERS IN SERIES:	1
TOTAL MASS OF CARBON (LBS):	20000.
FLOW RATE (GPM):	375.00 ← 750 GPM/2
HYDRAULIC LOADING (GPM/SQ.FT):	4.8310
EMPTY BED CONTACT TIME (MIN.):	14.539
DESIGN COMPOUND:	1,1-DCE
EXPECTED INFLUENT CONCENTRATION (PPB):	5.0000
MODEL INFLUENT CONCENTRATION (PPB):	10.000
EFFLUENT CRITERIA (PPB):	3.0000
EFFECTIVE K-VALUE (%):	50.000

TIME(DAYS)	VOLUME TREATED(GAL)	EFF. CONC.(PPB)	
20.0	10800000.	0.0000	
40.0	21600000.	0.0000	
60.0	32400000.	0.0000	
80.0	43200000.	0.0000	
100.0	54000000.	0.0000	
120.0	64800000.	0.0000	
140.0	75600000.	0.0000	
160.0	86400000.	0.0459	
180.0	97200000.	0.5277	
200.0	108000000.(PER TRAIN)	1.7511	← BREAKTHROUGH
220.0	118800000.	3.2091	
240.0	129600000.	4.5777	
260.0	140400000.	5.7540	
280.0	151200000.	6.7214	
300.0	162000000.	7.4955	
320.0	172800000.	8.1030	
340.0	183600000.	8.5733	
360.0	194400000.	8.9333	
380.0	205200000.	9.2065	
400.0	216000000.	9.4125	
420.0	226800000.	9.5667	
440.0	237600000.	9.6817	
460.0	248400000.	9.7670	
480.0	259200000.	9.8302	
480.0	259200000.	9.8302	

Note: The model influent concentration results from the impact of the other background compounds, which is determined by using a competitive adsorption model

LIQUID-PHASE CARBON ADSORPTION MODEL CALCULATIONS

CARBONAIR ENVIRONMENTAL SYSTEMS
7500 BOONE AVENUE NORTH, SUITE 101
BROOKLYN PARK, MN 55428
PHONE: 800-526-4999
FAX: 763-315-4614

CARBON ADSORBERS:	PC78
NO OF ADSORBERS IN SERIES:	2
TOTAL MASS OF CARBON (LBS):	40000.
FLOW RATE (GPM):	375.00 ← 750 GPM/2
HYDRAULIC LOADING (GPM/SQ.FT):	4.8310
EMPTY BED CONTACT TIME (MIN.):	29.078
DESIGN COMPOUND:	1,1-DCE
EXPECTED INFLUENT CONCENTRATION (PPB):	5.0000
MODEL INFLUENT CONCENTRATION (PPB):	10.000
EFFLUENT CRITERIA (PPB):	3.0000
EFFECTIVE K-VALUE (%):	50.000

TIME(DAYS)	VOLUME TREATED(GAL)	EFF. CONC.(PPB)	
50.0	27000000.	0.0000	
100.0	54000000.	0.0000	
150.0	81000000.	0.0000	
200.0	108000000.	0.0000	
250.0	135000000.	0.0000	
300.0	162000000.	0.0000	
350.0	189000000.	0.0000	
400.0	216000000.	0.0000	
450.0	243000000.(PER TRAIN)	1.2685	← BREAKTHROUGH
500.0	270000000.	4.4695	
550.0	297000000.	6.8759	
600.0	324000000.	8.3243	
650.0	351000000.	9.1276	
700.0	378000000.	9.5554	
750.0	405000000.	9.7773	
800.0	432000000.	9.8901	
850.0	459000000.	9.9467	
900.0	486000000.	9.9747	
950.0	513000000.	9.9881	
1000.0	540000000.	9.9945	
1050.0	567000000.	9.9976	
1100.0	594000000.	9.9992	
1150.0	621000000.	9.9999	
1200.0	648000000.	10.0001	

Note: The model influent concentration results from the impact of the other background compounds, which is determined by using a competitive adsorption model

DISCLAIMER: ACTUAL RESULTS MAY VARY SIGNIFICANTLY FROM THE MODEL. THE MODEL IS BASED ON THE ASSUMPTIONS THAT THE FLOW RATE AND INFLUENT CONCENTRATION ARE CONSTANT, AND ONLY THE CONTAMINANTS PROVIDED TO CARBONAIR ARE PRESENT IN THE WATER. VARYING OPERATING CONDITIONS CAN HAVE ADVERSE EFFECTS ON CARBON ADSORPTIVE CAPACITY. THE PREDICTED BED LIFE IS NOT GUARANTEED.

STAT MODEL CALCULATIONS 03/28/08
VERSION 4.1 13:15:56

CARBONAIR ENVIRONMENTAL SYSTEMS
7500 BOONE AVENUE NORTH, SUITE 101, BROOKLYN PARK, MN 55428
PHONE: 800-526-4999 FAX: 763-315-4614

UNIT MODEL:	STAT 720	WATER TEMPERATURE (F):	58.0
WATER FLOW RATE (GPM):	750.0	AIR TEMPERATURE (F):	35.0
AIR FLOW RATE (ACFM):	3500.0	AIR-TO-WATER RATIO:	35:1
OPERATING PRESS (ATM):	1.0	SAFETY FACTOR (%):	0.0

Influent Conc. for TRICHLOROETHENE 60.0 ppb

NO OF TRAY	REMOVAL EFF %	EFF CONC ppb	OFF-GAS CONC ug/l	AIR EMISSION lb/d
1	56.54610	26.0723	0.9694	0.3055
2	80.50136	11.6992	1.3800	0.4349
3	91.12791	5.3233	1.5622	0.4923
4	95.93784	2.4373	1.6446	0.5183
5	98.13482	1.1191	1.6823	0.5302
6	99.14248	0.5145	1.6996	0.5356

Influent Conc. for TETRACHLOROETHENE 15.0 ppb

NO OF TRAY	REMOVAL EFF %	EFF CONC ppb	OFF-GAS CONC ug/l	AIR EMISSION lb/d
1	56.88017	6.4680	0.2438	0.0768
2	81.02242	2.8466	0.3472	0.1094
3	91.57379	1.2639	0.3925	0.1237
4	96.24416	0.5634	0.4125	0.1300
5	98.32301	0.2515	0.4214	0.1328
6	99.25065	0.1124	0.4254	0.1340

Influent Conc. for 1,1-DICHLOROETHENE 5.0 ppb

NO OF TRAY	REMOVAL EFF %	EFF CONC ppb	OFF-GAS CONC ug/l	AIR EMISSION lb/d
1	63.39334	1.8303	0.0906	0.0285
2	86.45370	0.6773	0.1235	0.0389
3	94.96727	0.2516	0.1357	0.0428
4	98.12749	0.0936	0.1402	0.0442
5	99.30292	0.0349	0.1419	0.0447
6	99.74045	0.0130	0.1425	0.0449

Influent Conc. for TOTAL VOCs 80.0 ppb

NO OF TRAY	REMOVAL EFF %	EFF CONC ppb	OFF-GAS CONC ug/l	AIR EMISSION lb/d
1	57.03669	34.3706	1.3037	0.4108
2	80.97108	15.2231	1.8508	0.5832
3	91.45147	6.8388	2.0903	0.6587
4	96.13213	3.0943	2.1973	0.6925
5	98.24312	1.4055	2.2456	0.7077
6	99.20013	0.6399	2.2674	0.7146

03/28/08

VAPOR-PHASE CARBON MODEL CALCULATIONS
VERSION 1.2

CARBONAIR ENVIRONMENTAL SYSTEMS
2731 NEVADA AVENUE NORTH
NEW HOPE, MN 55427
PHONE: 800-526-4999
FAX: 763-544-2151

DESIGN COMPOUD:	TCE
EXPECTED CONC. (UG/L):	1.600
MODEL CONC. (UG/L):	1.700
TEMPERATURE (F):	90.000
RELATIVE HUMIDITY (%):	50.000
OPERATING PRESS (MM MERCURY):	760.000
MOLECULAR WEIGHT (GM/MOLE):	131.000
VAPOR PRESS (MM MERCURY):	103.057
COMPOUND DENSITY (GM/ML):	1.460
SOLUBILITY LIMIT (PPM):	1100.000
K VALUE (LIQUID)(UMOLE/GM)(L/UMOLE)**1/N:	106.000
1/N VALUE (LIQUID)(DIMENSIONLESS):	0.470
K VALUE (VAPOR)(UMOLE/GM)(L/UMOLE)**1/N:	1083.876
1/N VALUE (VAPOR)(DIMENSIONLESS):	0.457
CARBON ADSORPTIVE CAPACITY (%):	1.978
AIR FLOW RATE (CFM):	3500.000
CARBON USAGE (LBS/DAY):	27.010

Note: The model concentration results from the impact of the other background compounds, which is determined by using a competitive adsorption model.

UG = microgram, UMOLE = micromole

DISCLAIMER: ACTUAL RESULTS MAY VARY SIGNIFICANTLY FROM THE MODEL. THE MODEL IS BASED ON THE ASSUMPTIONS THAT THE FLOW RATE AND INFLUENT CONCENTRATION ARE CONSTANT, AND ONLY THE CONTAMINANTS PROVIDED TO CARBONAIR ARE PRESENT IN THE AIR. VARYING OPERATING CONDITIONS CAN HAVE ADVERSE EFFECTS ON CARBON ADSORPTIVE CAPACITY. THE PREDICTED CARBON USAGE RATE IS NOT GUARANTEED.

APPENDIX C

Discussion of WhAEM Modeling Results

GeoTrans, Inc.
A TETRA TECH COMPANY

Date: December 31, 2008

From: Christopher Gutmann
Senior Hydrogeologist

Recipient: Jeff Rackow, PE.; Dr. Jasenka Zbozinek
Address: 4801 East Washington St, Suite 260, Phoenix Arizona 85034

Subject: Implications of Potential Future SRP Groundwater Pumping from the Lower Sand and Gravel Subunit

The purpose of this letter is to evaluate the potential effects associated with Salt River Project (SRP) resuming the 1,000 to 3,000 gallon per minute (gpm) pumping from irrigation wells SRP 8.5E-7.5N and SRP 9.5E-7.7N. These wells are understood to be screened within a depth interval that intersects the Lower Sand and Gravel Subunit (LSGS) of the Upper Alluvial Unit (UAU) in the vicinity of the West Osborn Complex (WOC) Water Quality Assurance Revolving Fund (WQARF) Site in Phoenix, Arizona. A concern exists for whether this pumping would capture part of a trichloroethene (TCE) contamination plume present in the LSGS. If this occurred, contamination would be spread both laterally and vertically toward the pumping wells, and contamination might be discharged into the Grand Canal as groundwater was pumped to supplement irrigation water supplies.

This effort primarily is based on work conducted by HSI GeoTrans, Inc (now GeoTrans, Inc) in January 2000 as a basis for the determination of aquifer properties. The draft document is identified by title as *A Model of 3-Dimensional Groundwater Flow and TCE Transport at the West Osborn Complex Phoenix, Arizona*, Prepared for United Industrial Corporation, January 11, 2000. As supplementary information and guidance, this effort references the aquifer characteristics for the Upper, Middle and Lower-Alluvial Units (UAU, MAU, and LAU) as described in ADWR Modeling Report #8, *A Regional Groundwater Flow Model of the Salt River Valley, Phase II Phoenix Active Management Area Numerical Model, Calibration and Recommendations*, 1994 (the SRV Model).

After a prolonged period of inactivity in 1996, SRP turned on their well SRP 9.5E-7.7N (the SRP well) (screened 220 – 685 feet bgs) for a brief period of time (30 - 45 days) in early summer, 1997. During 1997, GeoTrans monitored water levels on a monthly basis at a set of groundwater monitoring wells in the vicinity of the SRP well, including MW-2M, MW-3M, MW-4M, MW-6M and MW-7M. An estimated 600-700 acre-feet of groundwater was pumped during this time, at a discharge rate believed to be approximately 2,600 gpm. Drawdown measurements in the monitored wells ranged from 24 to 40 feet. These results are consistent with a conceptual understanding that the majority of the water produced by this well comes from the LSGS.

For the purposes of evaluating the effects of pumping the SRP well, the LSGS can be represented in a simple model as homogeneous, infinitely continuous, and uniformly 50 feet thick. Hydraulic conductivity is estimated at 235 feet per day (ft/day), and Storativity as 1E-4.

GeoTrans utilized the software package AQTESOLV 4.02 to simulate the effect of 2,600 gpm pumping from the LSGS after 30 days. The results of this simulations are included as Figure 1 below.

GeoTrans, Inc | A Tetra Tech Company
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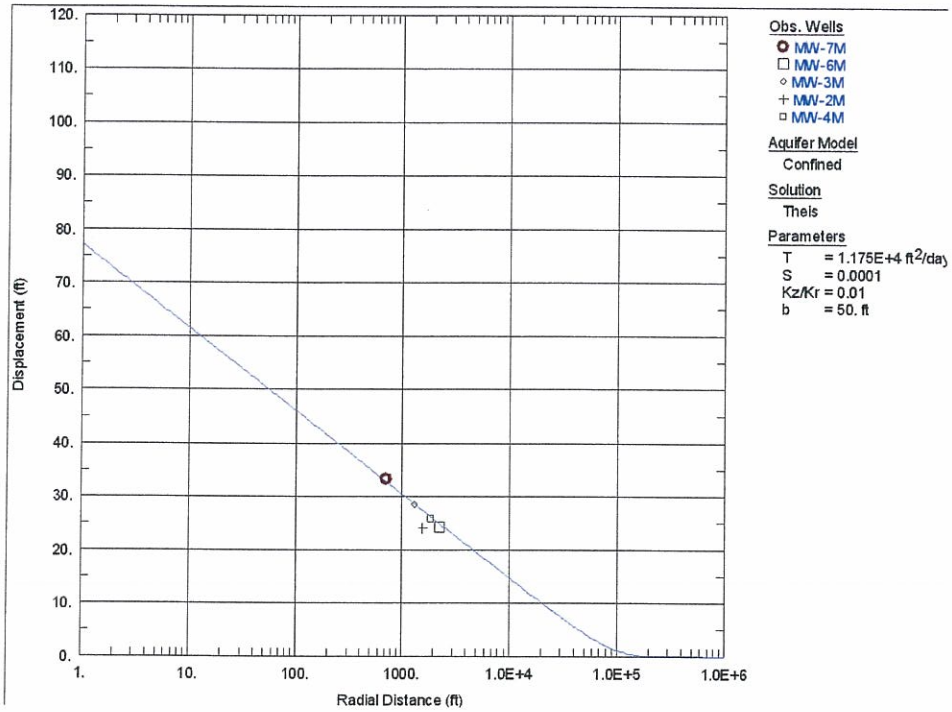


Figure 1. Simulated and Observed Drawdown from 2,600 gpm pumping at SRP 9.5E-7.7N after 30 days

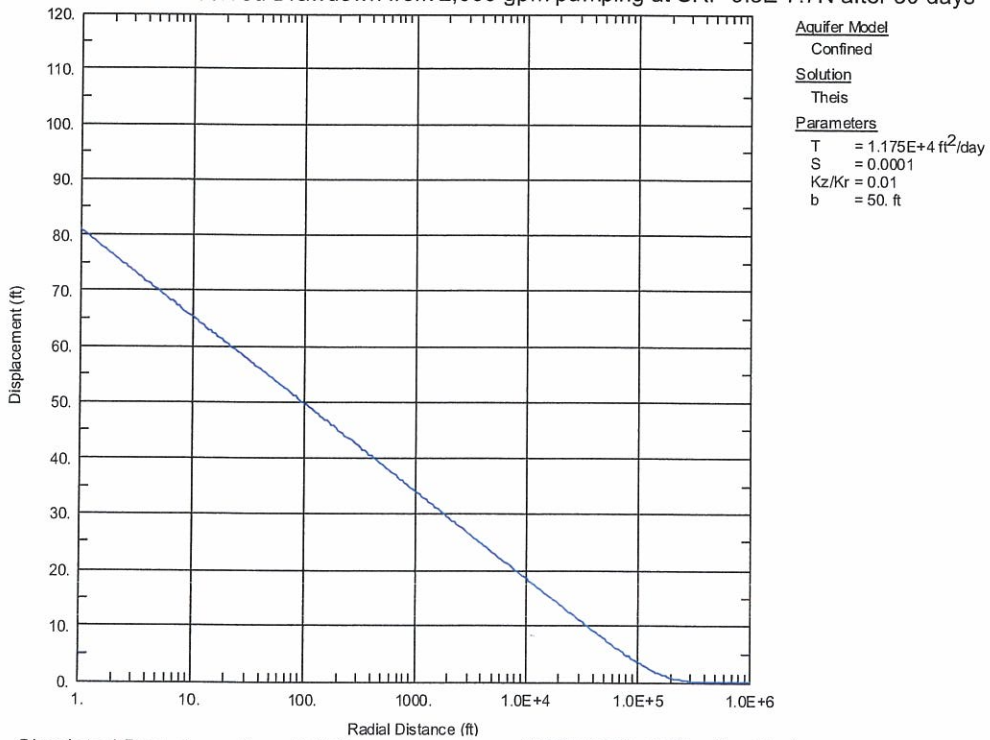


Figure 2. Simulated Drawdown from 2,600 gpm pumping at SRP 9.5E-7.7N after 90 days

To simulate the effect of prolonged SRP 9.5E-7.7N pumping on the LSGS, AQTESOLV was then used to extend the simulation time from 30 days to 90 days. The results are presented in Figure 2. The results are additionally presented in map-view in attached Figure 3. For reference, the TCE groundwater plume present in the LSGS is illustrated in green on the map beneath the drawdown contours.

Implications of Resumed LSGS Pumping

Resumed pumping from SRP 9.5N-7.7E for periodic durations of 30 to 90 days would create a cone-of-depression (Figure 3) around the SRP well which would cause the TCE groundwater plume to migrate toward the SRP well. Figure 4 illustrates historic water levels measured in LSGS, MAU, and LAU groundwater wells within several miles of the WOC Site. Water levels in the MAU have typically been higher than those in the LSGS or the LAU, presumably because the latter, more productive aquifers have been depressurized by regional groundwater pumping. During the late 1990s, an upward vertical head difference of approximately 30 feet appears to have been present from the MAU to the LSGS. During the brief period when SRP turned on the SRP well, water levels appear to have declined in the LSGS faster than in the MAU, increasing the upward vertical gradient by an additional 28 feet over the same interval. Under either set of conditions, any contamination present in the LSGS would not be expected to migrate vertically downward into the MAU.

Deepening the SRP well

One approach to prevent pumping contaminated groundwater into the Grand Canal would be to equip the SRP well with a wellhead treatment system. Another option might be to drill a replacement well to a greater depth interval where pumping effects would not appreciably influence the TCE plume. The SRV model suggests that the hydraulic conductivity for the LAU is approximately 6 ft/day. If the SRP well were deepened so that it had a 600-foot screened interval from the top of the LAU (approximately 1,000 ft bgs) down to 1,600 feet bgs, pumping at 2,600 gpm would produce drawdown of approximately 98 feet in the LAU, 1000 feet radially away from the pumping well. An alternate assumption is that deepening the SRP well to a less productive zone would require reduced pumping rates due to the potential inability of a deepened well to produce the 2,600 gpm. An analysis conducted using a reduced pumping rate of 1,500 gpm, with the same aquifer conditions, yields drawdowns of approximately 56 feet in the LAU, at a 1000-foot radius. This induced vertical head differential of 56 feet spread over the thickness of the MAU (~550 ft) produces a vertical gradient of 0.10 ft/ft. The SRV model suggests that the bulk vertical hydraulic conductivity (Kv) of the MAU is approximately 0.1 ft/day. This parameter is considered to have the least degree of confidence in the SRV model, however. The Kv for the MAU is a function of all of the Kv values for each of the smaller subunits that comprise the overall MAU. Flow perpendicular to bedding is affected by each layer it encounters. The bulk hydraulic conductivity is typically controlled most by the layers with the lowest vertical hydraulic conductivities. In a unit, particularly such as the MAU which is dominated by clays and silts, it is not uncommon for layered heterogeneity to lead to regional anisotropy values on the order of 100:1 or larger (Freeze and Cherry, 1979). A horizontal hydraulic-conductivity value of 10 ft/d is consistent with the properties of sand or silty-sand. The SRV model report describes the MAU as mainly consisting of clay, silt, mudstone and gypsiferous mudstone with some interbedded sand and gravel. Where horizontal flow is likely to be determined by the hydraulic conductivities associated with the coarser-grained subunits, vertical flow is likely to be controlled by the finer-grained sediments of the clays, silts, etc. A reasonably range of hydraulic-conductivity values for these sediments is 10^{-5} to 10^{-1} ft/d. Assuming that a distribution of values is present throughout the MAU, flow will be generally controlled by the lower end of the range. Thus, a reasonable range of Kv values for the entire MAU might be 10^{-5} to 10^{-3} ft/d. For the purposes of this analysis, a Kv of 0.001 ft/d was selected, to be conservative and assume that the overall distribution of sediment types might be skewed toward the coarser end of the finer-grained range.

Using Darcy's law (Q=KiA, where K=0.001ft/d, i=0.10 and A=3.14E6 ft^2) the vertical flow through the 1000-ft radius circle around the well would be approximately 320 ft^3/d (1.7 gpm), an essentially negligible discharge over such an area.

Summary of Modeling and Comments on Interpretation

The impact of potential pumping from SRP 9.5E-7.7N is clear in Figure 3. If this production well is allowed to resume pumping at historical rates, it will easily capture the TCE plume in the LSGS. Wellhead treatment for the SRP well would therefore be required.

If the SRP well were deepened to pump from the LAU, the thickness of the overlying silts and clays of the MAU is such that wellhead treatment would not be necessary. The combination of the MAU thickness combined with the interbedded nature of the MAU both also make it very unlikely that the pumping effects from a deepened SRP well would propagate vertically enough to reverse the vertical hydraulic gradient, and cause the TCE plume to migrate downward into the MAU.

References Utilized in Model Development

ADEQ, Various aquifer test results from wells in the general vicinity of the West Osborn Complex

ADWR, Mar 1994. "*A Regional Groundwater Flow Model of the Salt River Valley – Phase II Phoenix Active Management Area Numerical Model, Calibration, and Recommendations*", Modeling Report No. 8

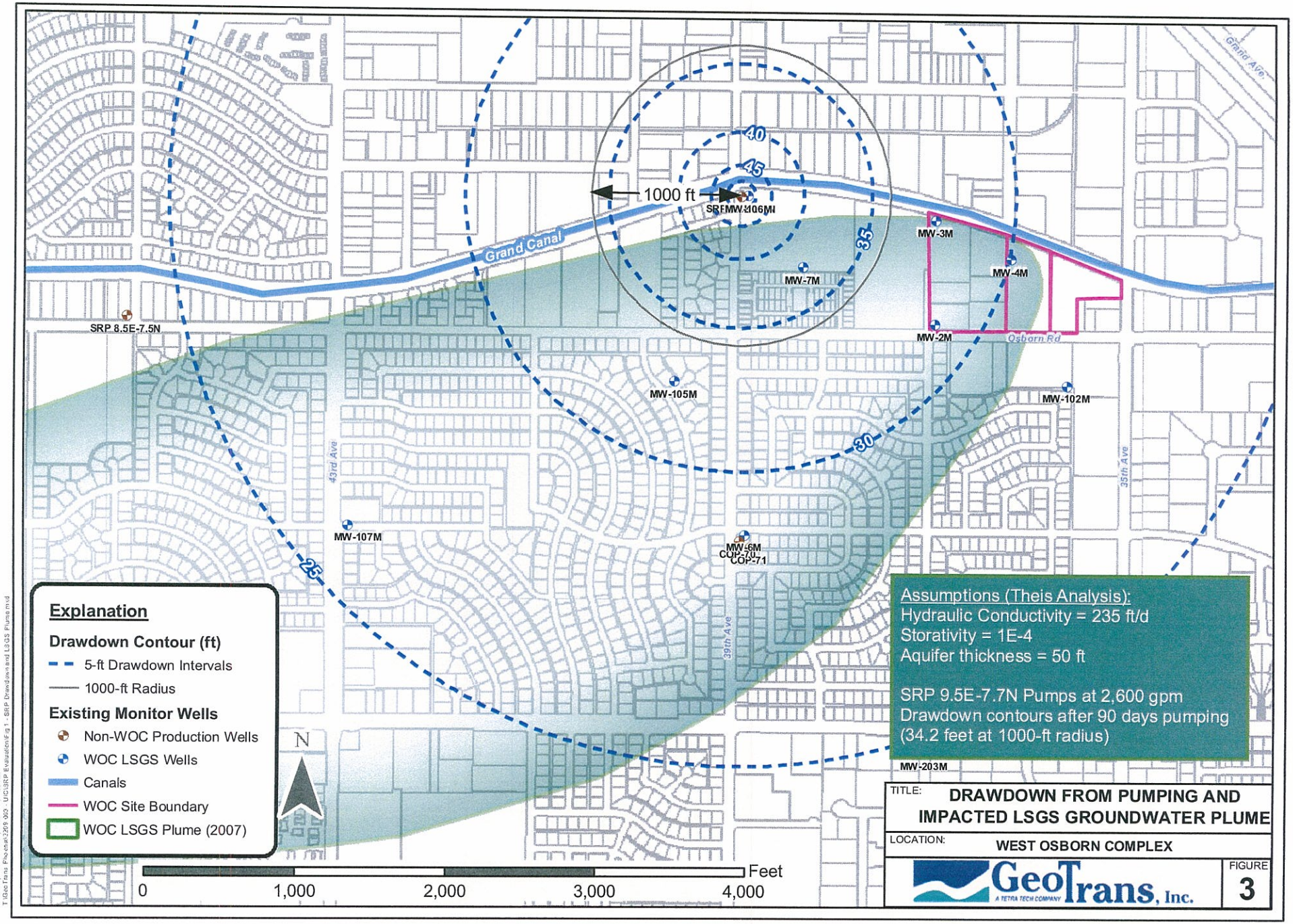
ADWR, Oct 2006. "*Salt River Valley Model Geology Update*" Provisional Report. Modeling Report No. 16.

EPA Office of Research and Development, April 2005. WhAEM2000

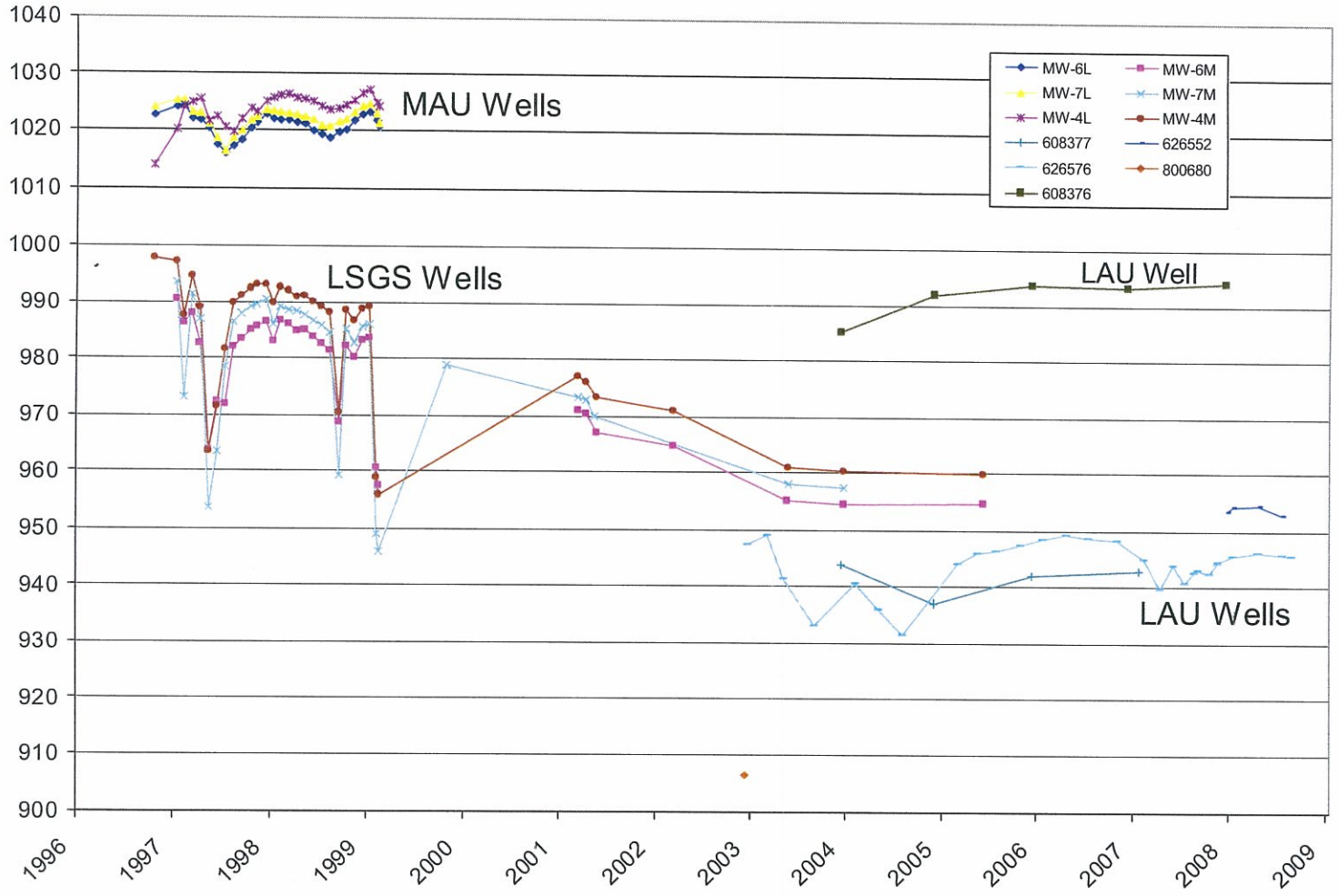
Freeze, A., and Cherry, J. "*Groundwater*" Prentice-Hall, Englewood Cliffs, NJ., 1979.

HSI GeoTrans, Inc, Jan 2000. "*A Model of 3-Dimensional Groundwater Flow and TCE Transport at the West Osborn Complex, Phoenix Arizona*". Prepared for United Industrial Corporation.

SRP Letter Report, June 2006. Various aquifer test results from wells in the general vicinity of the West Osborn Complex



Thursday, November 6, 2008 11:54:00 AM
T:\GeoTrans Phoenix\2269.005 - UIC\SRP Evaluation\Fig 1 - SRP Drawdown and LSGS Plume.mxd



Water Levels in Wells near
West Osborn Complex WQARF Site

GeoTrans, Inc.

FIGURE
4