



APTIM
6380 South Fiddlers Green, Suite 310
Greenwood Village, CO 80111
Tel: +1 303 741 7700
Fax: +1 303 741 7479

September 15, 2023

Mr. Aaron Galer
Senior Environmental Specialist
Bargath LLC
295 Chipeta Way #1
Salt Lake City, UT 84108-1285

RE: Phase 2 Site Investigation Report
Cottonwood Compressor Station

Dear Mr. Galer:

Aptim Environmental & Infrastructure, LLC. presents this letter report Phase 2 of investigation actions at the Cottonwood compressor station. This report presents the results of additional groundwater investigation actions completed.

Background

During installation of cathodic protection borings at the site, hydrocarbon impacts were observed to the west of the compressor building. While the cathodic protection borings were advanced to 30 feet below grade, the extent of impacts vertically and horizontally was not known. Investigation activities were completed with the objective of defining the extent of hydrocarbon impacts.

The first phase of investigation advanced soil borings to delineate the extent of soil impacts. Soil profile observations indicate heterogeneous layers of infilled gravel, cobbles, clays, sandstones, and shales. No lithology consistency was observed between borings. The most significant hydrocarbon concentrations observed were observed in SB03, 04 and 06 located near and along the former dump lines to the west of the compressor building. Note that the highest concentrations were identified at depths greater than 50 feet and may be associated with groundwater. Unsaturated soils were delineated.

Upon monitoring well completion, only MW-2 and MW-3 contained groundwater at depths from 57 to 60 feet below grade. As MW-1 did not contain water, no survey was completed and therefore, no groundwater flow determined. Low concentrations of hydrocarbons were noted in both MW-2 and MW-3 and groundwater delineation was not complete.

Scope of Work

Additional monitoring wells were installed at the site in attempt to delineate groundwater concentrations. Four wells were installed at the locations presented on **Figure 1**. At each location, the boreholes were cleared of utilities by pot-holing to a depth of ten feet below grade.

Four well locations were advanced to 70 feet below grade and the wells installed utilizing sonic drilling methods. At each location, soils were logged for lithology and field screened for evidence of hydrocarbon contamination. Each well was constructed with twenty feet of screen. Following installation, the wells were developed, surveyed, gauged, and sampled. The existing wells were also gauged and sampled



during the same event. Groundwater sample analysis included VOCs, chlorides, sulfates, and TDS per COGCC Table 915-1 requirements.

Results

Logs for the new wells are attached. Soil profile observations indicate heterogeneous layers of infilled silt, fine grained sand, lean clay, sandstone and shale gravel and cobbles.

Liquid level measurement data is presented on **Table 1**. Groundwater was present in each of the wells installed. Groundwater flow is to the south/southwest (**Figure 2**).

Petroleum hydrocarbon concentrations were present in MW-01, 02, 03 and 04 (**Table 2**) with the highest benzene concentration in MW-01. **Figure 3** presents benzene concentrations in groundwater. No water was present in MW-01 upon installation, but with high spring melt, groundwater levels were up during sampling.

Recommendations

Based upon the incomplete delineation of groundwater, additional groundwater monitoring wells are recommended to the south and southwest. Proposed locations of the new wells are presented on **Figure 4**. Wells will be installed with construction like the prior wells. Following installation, wells will be developed, surveyed, and sampled to determine if groundwater delineation is complete.

If you have any questions or comments, please contact me at (720) 554-8198.

Sincerely,

A handwritten signature in black ink, appearing to read 'David Way', is written over a faint, circular watermark or background.

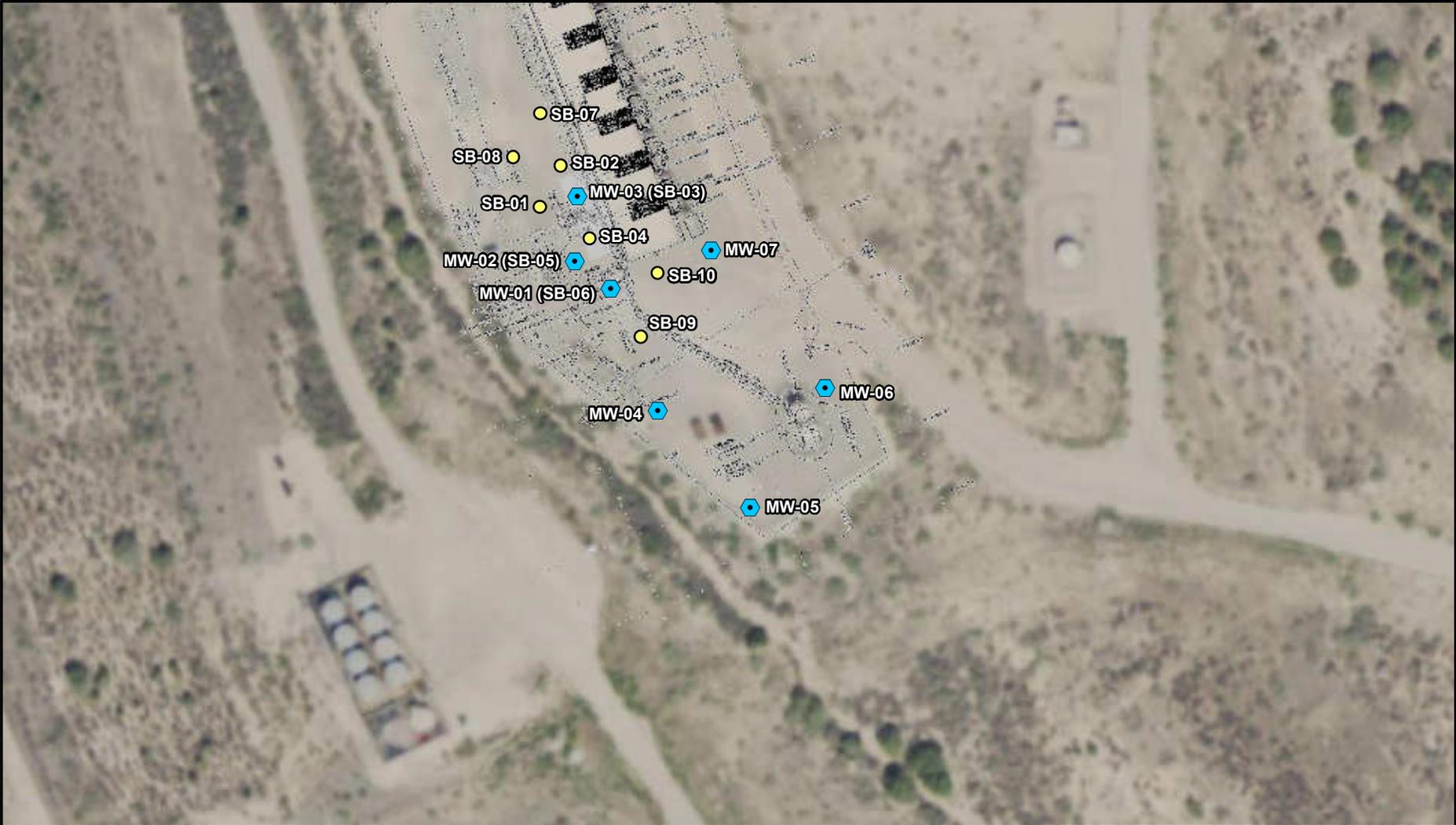
David Way
Vice President

Aptim Environmental & Infrastructure, LLC.

Please Reply To: David Way
Phone: 720.554.8198
E-Mail Address: david.way@aptim.com

Attachments

- Figure 1 - Site Map
- Figure 2 – Groundwater Flow Map
- Figure 3 – Benzene Iso-Concentration Map
- Figure 4 - Proposed Monitoring Wells
- Table 1 – Liquid Levels
- Table 2 – Groundwater Analytical Results
- Well Logs

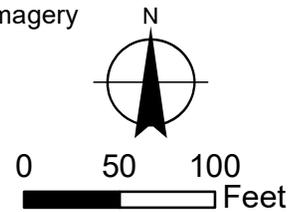


Legend:

 Monitoring Well

Notes:

1. Background imagery is the 2017 USGS National Imagery Imagery Program.



Williams (Bargath, LLC)

Cottonwood Compressor
Garfield, CO

FIGURE
NUMBER

1

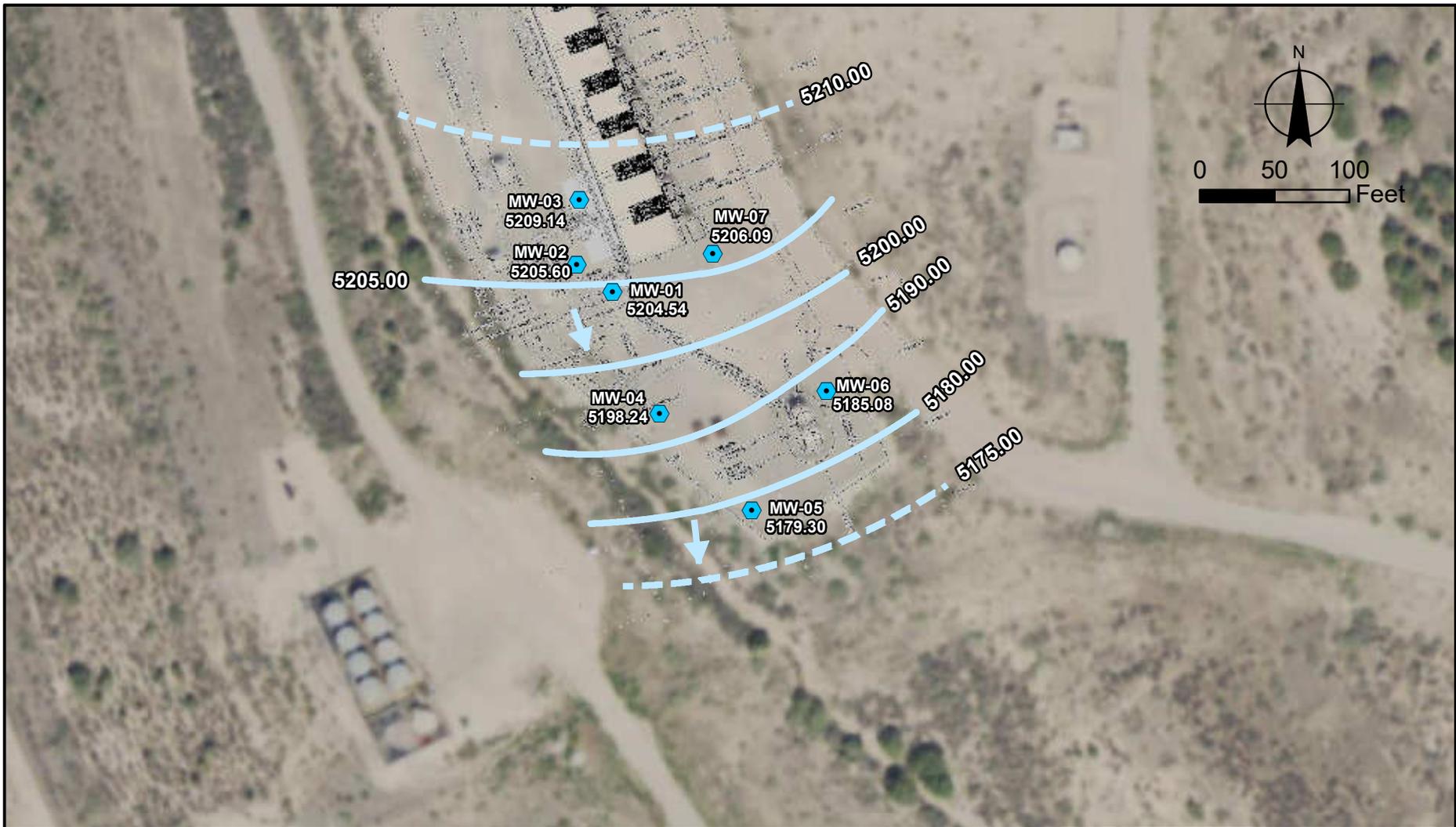
Site Map



APTIM

5690 DTC Boulevard, Suite 600
Greenwood Village, CO 80111
www.APTIM.com

F:\Projects\Williams\Cottonwood\GIS_Documents\Project_Maps\Cottonwood Groundwater July 2023 Map.mxd; Analyst: Heather Vollmer; Date: 8/14/2023 5:41:50 PM



Legend:

 Monitoring Well

Notes:

1. Background imagery is the 2017 USGS National Imagery Imagery Program.
2. Ground water levels were measured July 10, 2023.

Williams (Bargath, LLC)

Cottonwood Compressor
Garfield, CO

FIGURE
NUMBER

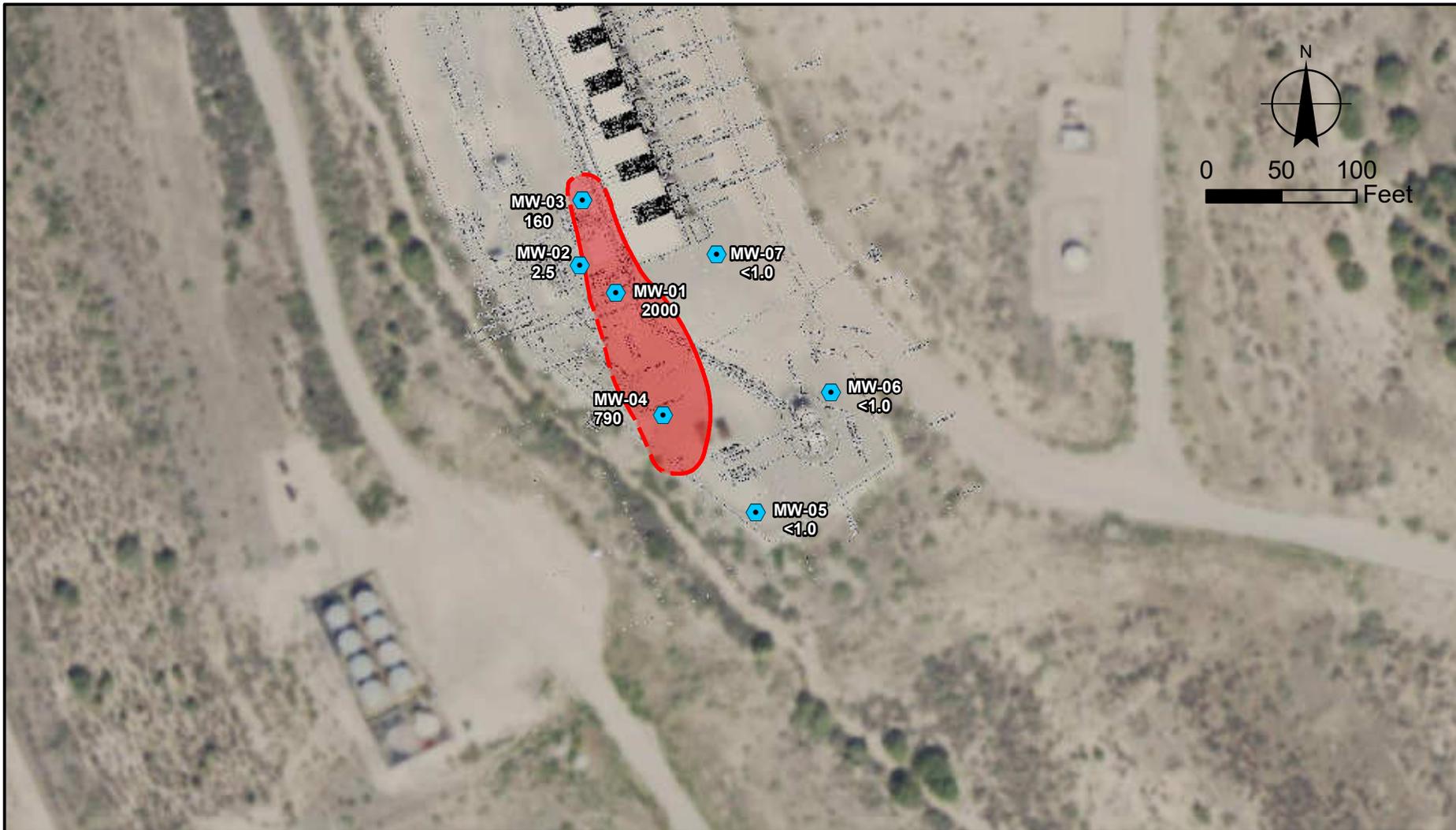
2

**Groundwater Flow
July 2023**



APTIM

5690 DTC Boulevard, Suite 600
Greenwood Village, CO 80111
www.APTIM.com



Legend:

- Monitoring Well
- COGCC Benzene Target Concentration Line >5.0
- Inferred Benzene Target Concentration Line >5.0
- Estimated Benzene Target Contamination Exceedance Zone 5.0 µg/L

Notes:

1. Background imagery is the 2017 USGS National Imagery Imagery Program.
2. Benzene samples were collected July 11, 2023.
3. Colorado Oil & Gas Conservation Commission (COGCC) Table 910-1 Concentration Level for Benzene = 5 µg/L.

Williams (Bargath, LLC)

Cottonwood Compressor
Garfield, CO

FIGURE
NUMBER

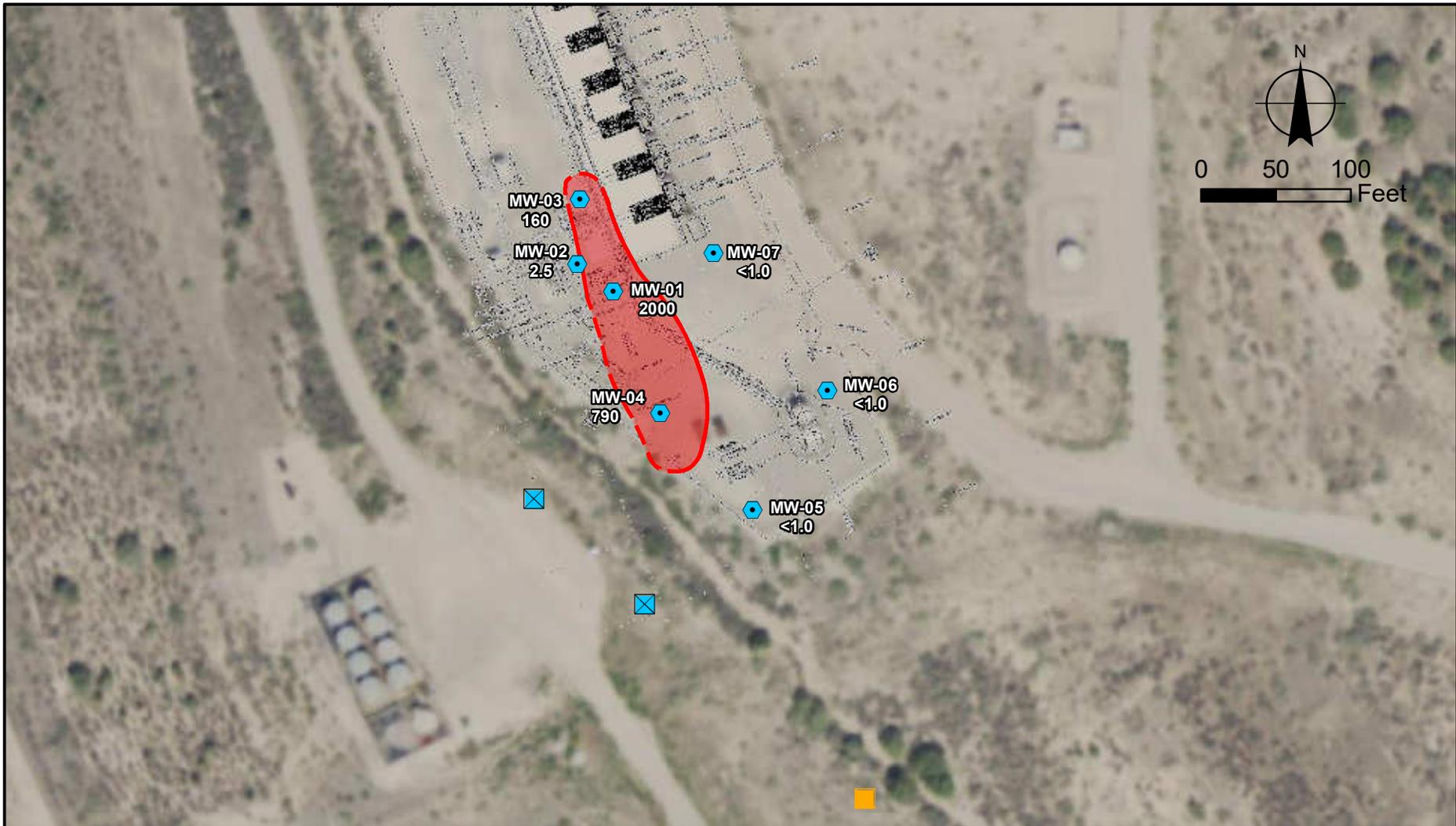
3

July 2023
Benzene Isoconcentration Map



APTIM

5690 DTC Boulevard, Suite 600
Greenwood Village, CO 80111
www.APTIM.com



Legend:

-  Monitoring Well
-  COGCC Benzene Target Concentration Line >5.0
-  Inferred Benzene Target Concentration Line >5.0
-  Estimated Benzene Target Contamination Exceedance Zone 5.0 µg/L
-  Proposed Monitoring Well
-  Contingent Proposed Monitoring Well

Notes:

1. Background imagery is the 2017 USGS National Imagery Imagery Program.
2. Benzene samples were collected July 11, 2023.
3. Colorado Oil & Gas Conservation Commission (COGCC) Table 910-1 Concentration Level for Benzene = 5 µg/L.

Williams (Bargath, LLC)

Cottonwood Compressor
Garfield, CO

FIGURE
NUMBER

4

Proposed Monitoring Wells



APTIM

5690 DTC Boulevard, Suite 600
Greenwood Village, CO 80111
www.APTIM.com

Table 1
 Bargath LLC - Cottonwood CS
 Comprehensive Liquid Level Data

Well ID	LATITUDE NAD83 DEGREES	LONGITUDE NAD83 DEGREES	Ground Elevation (ft BM)	Top of Casing Elevation (ft BM)	Date	Depth to Groundwater (Ft from TOC)	Depth to Product (ft below TOC)	Product Thickness (ft)	Corrected GW Elevation (ft BM) (1)
MW-01	39.48165887	-107.9919979	99.27	99.00	1/29/2023	DRY @ 59.85			
MW-01	39.48165887	-107.9919979	99.27	99.00	4/3/2023	DRY @ 59.85			
MW-01	39.48165887	-107.9919979	99.27	99.00	7/10/2023	45.72			53.28
MW-02	39.4817069	-107.992085	98.89	98.58	1/29/2023	60.33			38.25
MW-02	39.4817069	-107.992085	98.89	98.58	4/3/2023	58.07			40.51
MW-02	39.4817069	-107.992085	98.89	98.58	7/10/2023	44.24			54.34
MW-03	39.48182622	-107.9920829	99.98	99.51	1/29/2023	57.48			42.03
MW-03	39.48182622	-107.9920829	99.98	99.51	7/10/2023	41.63			57.88
MW-04	39.48143804	-107.9918788	97.55	97.24	7/10/2023	50.26			46.98
MW-05	39.48126589	-107.9916541	96.60	96.27	7/10/2023	68.23			28.04
MW-06	39.4814881	-107.9914848	98.59	97.93	7/10/2023	64.11			33.82
MW-07	39.48173458	-107.9917633	99.17	98.79	7/10/2023	43.96			54.83

Table 2
Bargath LLC - Cottonwood CS
Comprehensive Groundwater Analytical Summary

Sample Location	Media	COGCC Table 915-1 Concentration Levels	5 µg/L	1000 µg/L	700 µg/L	10,000 µg/L	67 µg/L	67 µg/L	140 µg/L	250 mg/l or <1.25 X Background	Background		Field Parameters				
											<1.25 X Background	250 mg/l or <1.25 X Background	Dissolved Oxygen (mg/L)	ORP (mV)	Conductivity (mS/cm)	Temperature (°C)	pH
		Sampling Date	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Total Xylenes (µg/L)	1,2,4-Trimethylbenzene (µg/L)	1,3,5-Trimethylbenzene (µg/L)	Naphthalene (µg/L)	Chloride (mg/L)	TDS (mg/L)	Sulfate (mg/L)					
MW01	Groundwater	1/29/2023	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
MW01	Groundwater	7/11/2023	2000	260	310	2600	230	240	<5.0	37.1	890	73	1.76	-119.2	1.400	18.0	7.32
MW02	Groundwater	1/29/2023	7.2	14	<1.0	13	<1.0	<1.0	<5.0	36.9	1100	300	NT	NT	NT	NT	NT
MW02	Groundwater	7/11/2023	2.5	1.8	<1.0	<3.0	<1.0	<1.0	<5.0	32.9	950	290	1.39	-106.9	1.341	16.5	7.29
MW03	Groundwater	1/29/2023	190	7.1	90	700	67	80	<5.0	43.9	890	58	NT	NT	NT	NT	NT
MW03	Groundwater	7/11/2023	160	<1.0	69	240	64	78	<5.0	34.2	1000	290	1.79	-114.5	1.619	16.8	7.22
MW03 DUP	Groundwater	7/11/2023	170	<1.0	73	200	68	82	<5.0	34.4	1100	280	1.79	-114.5	1.619	16.8	7.22
MW04	Groundwater	7/11/2023	790	<1.0	<1.0	<1.0	<1.0	1.3	<5.0	41.3	940	180	2.02	-64.1	1.445	16.9	7.07
MW05	Groundwater	7/11/2023	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	42.7	1100	320	3.01	-39.4	1.580	17.6	7.06
MW06	Groundwater	7/11/2023	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	38.7	1400	550	3.08	5.8	1.802	17.5	7.07
MW07	Groundwater	7/11/2023	<1.0	1.0	<1.0	<1.0	<1.0	<1.0	<5.0	38.7	1000	330	1.43	-1.0	1.514	18.2	7.10

Note:
J - Indicates an estimated value below laboratory reporting limit
NS = Not Sampled
NT = Not Tested
µg/L - Micrograms per Liter
mg/L - Milligrams per Liter
Above COGCC Table 915-1 Concentration Level



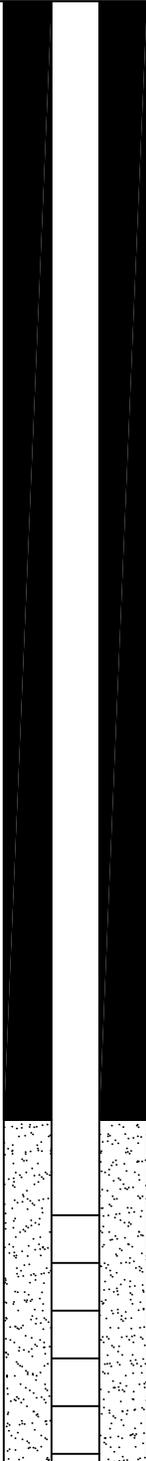
2872 N. Ridge Road, Suite 102
 Wichita, Kansas 67205
 (316) 220-8020

Site Id: MW-04

Date Started: 06/19/23

Project Name: Williams-Cottonwood CS	Coordinate X: 242667	Blank Casing: type: PVC dia:2.00in fm:0.00' to:50.00'
Project Number: 631029767	Coordinate Y: 4374480	
Location: Rulison, CO	Static Water Level: 50.26'	Screens: type:Slotted size:0.010in dia:2.00in fm:50.00' to:70.00'
Logged By: Phil Osborn	Measuring Point: Ground Level	
Contractor: GDI Drilling, Inc.	Total Depth: 70.00'	Annular Fill: type: Cement fm:0.00' to:2.00' type: Bentonite fm:2.00' to:48.00' type: Silica Sand fm:48.00' to:70.00'
Drilling Method: Geoprobe Sonic Rig	Borehole Dia.: 6.00 in OD	
Remarks: 12" diameter HydroVac hole to 10'. Drove 4.5 inch by 10' continuous sample barrel.		Completed Depth: 70.00'

Depth	Well Construction	Water Level	% Recovery	PID	Sample No.	USCS Code	Graphic Log	Material Description
0-10'						ML		0-10' Silt; Hydrovaced to 10', medium to large gravel and cobbles
10-20'				1.6		ML		10-20' Silt; moist, brown (7.5YR 5/3), trace lean clay, fine sand and gravel, non-plastic
20-30'			20	2.1		ML		20-30' Silt and Sand; moist, brown (7.5Y 5/3), fine grained sand
30-70'			30	13		ML		

Depth	Well Construction	Water Level	% Recovery	PID	Sample No.	USCS Code	Graphic Log	Material Description
25			30			ML		
				4.7				Sandstone cobbles and gravel at 26' and 27'
30				1.2				30-48' Silt and Gravel: moist, yellow brown (10YR 5/4), non- to low plastic, coarse gravel, some lean clay and trace fine grained sand
35				80				
40				15			ML	
45				100				
50				2.4			ML	48-51' Silt and Sand: saturated, yellow brown (10YR 5/6), fine sand, trace of coarse gravel, non-plastic
		3.2			ML	51-54' Silt and Cobbles: wet to saturated, yellow brown, some fine sand and trace gravel		
55		100				54-66' Silt and Sand: wet, yellow brown, fine gained sand, trace lean clay		



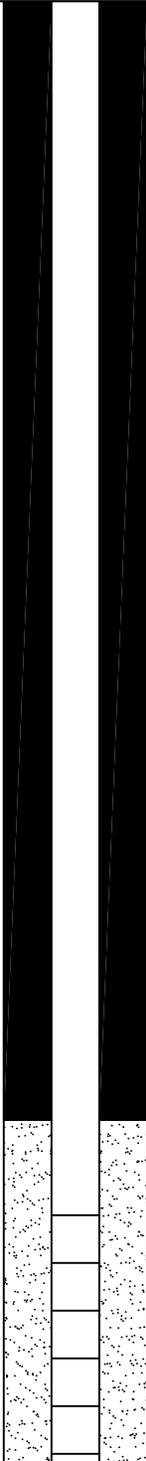
2872 N. Ridge Road, Suite 102
 Wichita, Kansas 67205
 (316) 220-8020

Site Id: MW-05

Date Started: 06/20/23

Project Name: Williams-Cottonwood CS	Coordinate X: 242687	Blank Casing: type: PVC dia:2.00in fm:0.00' to:50.00'
Project Number: 631029767	Coordinate Y: 4374460	
Location: Rulison, CO	Static Water Level: 68.23'	Screens: type:Slotted size:0.010in dia:2.00in fm:50.00' to:70.00'
Logged By: Phil Osborn	Measuring Point: Ground Level	
Contractor: GDI Drilling, Inc.	Total Depth: 70.00'	Annular Fill: type: Cement fm:0.00' to:2.00' type: Bentonite fm:2.00' to:48.00' type: Silica Sand fm:48.00' to:70.00'
Drilling Method: Geoprobe Sonic Rig	Borehole Dia.: 6.00 in OD	
Remarks: 12" diameter HydroVac hole to 10'. Drove 4.5 inch by 10' continuous sample barrel.		Completed Depth: 70.00'

Depth	Well Construction	Water Level	% Recovery	PID	Sample No.	USCS Code	Graphic Log	Material Description
0								0-10' Silt; Hydrovaced to 10', medium to large gravel and cobbles
5						ML		
10				1.3				10-25' Silt; moist, brown (7.5YR 5/4), trace fine sand and gravel, trace lean clay, non-plastic
15			20					
20				3.7		ML		
25			90	7.2				

Depth	Well Construction	Water Level	% Recovery	PID	Sample No.	USCS Code	Graphic Log	Material Description
25			90					25-30' Silt; dry, light brown (7.5YR 6/4), trace sandstone cobbles and gravel
				9.5				
30				1.3				30-49' Silt; moist, yellow brown (10YR 5/4), trace coarse gravel, trace fine grained sand and lean clay, non-plastic
			60	4.6		ML		
35				30				
			100	1.6				Sandstone and shale cobbles 45'-46'
45				0.6				49-63' Silt; wet to saturated, light brown (7.5YR 4/3), trace of coarse gravel and lean clay, low plasticity
				100				
50								
55								



2872 N. Ridge Road, Suite 102
 Wichita, Kansas 67205
 (316) 220-8020

Site Id: MW-06

Date Started: 06/20/23

Project Name: Williams-Cottonwood CS	Coordinate X: 242702	Blank Casing: type: PVC dia:2.00in fm:0.00' to:50.00'
Project Number: 631029767	Coordinate Y: 4374485	
Location: Rulison, CO	Static Water Level: 64.11'	Screens: type:Slotted size:0.010in dia:2.00in fm:50.00' to:70.00'
Logged By: Phil Osborn	Measuring Point: Ground Level	
Contractor: GDI Drilling, Inc.	Total Depth: 70.00'	Annular Fill: type: Cement fm:0.00' to:2.00' type: Bentonite fm:2.00' to:48.00' type: Silica Sand fm:48.00' to:70.00'
Drilling Method: Geoprobe Sonic Rig	Borehole Dia.: 6.00 in OD	
Remarks: 12" diameter HydroVac hole to 10'. Drove 4.5 inch by 10' continuous sample barrel.		Completed Depth: 70.00'

Depth	Well Construction	Water Level	% Recovery	PID	Sample No.	USCS Code	Graphic Log	Material Description
0-10'								0-10' Silt; Hydrovaced to 10', medium to large gravel and cobbles
10-23'				1.5		ML		10-23' Silt; moist, yellow brown (10YR 5/4), trace fine sand and gravel, non-plastic
23-25'			40	2.6		ML		23-25' Silt and Cobbles; moist, yellow brown (10YR 5/4), some fine grained sand
70'			70	1.6		ML		



2872 N. Ridge Road, Suite 102
 Wichita, Kansas 67205
 (316) 220-8020

Site Id: MW-07

Date Started: 06/21/23

Project Name: Williams-Cottonwood CS

Coordinate X: 242679

Blank Casing:

Project Number: 631029767

Coordinate Y: 4374513

type: PVC dia:2.00in
 fm:0.00' to:50.00'

Location: Rulison, CO

Static Water Level: 43.96'

Screens:
 type:Slotted size:0.010in dia:2.00in
 fm:50.00' to:70.00'

Logged By: Phil Osborn

Measuring Point: Ground Level

Contractor: GDI Drilling, Inc.

Total Depth: 70.00'

Drilling Method: Geoprobe Sonic Rig

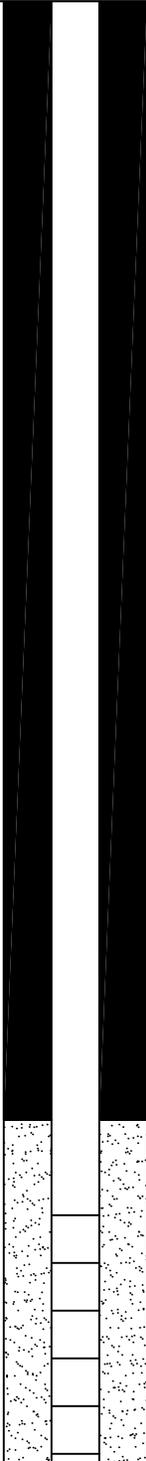
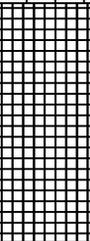
Borehole Dia.: 6.00 in OD

Annular Fill:
 type: Cement fm:0.00' to:2.00'
 type: Bentonite fm:2.00' to:48.00'
 type: Silica Sand fm:48.00' to:70.00'

Remarks: 12" diameter HydroVac hole to 10'. Drove 4.5 inch by 10' continuous sample barrel.

Completed Depth: 70.00'

Depth	Well Construction	Water Level	% Recovery	PID	Sample No.	USCS Code	Graphic Log	Material Description
0-10'						ML		0-10' Silt; Hydrovaced to 10', medium to large gravel and cobbles
10-25'			30	1.3		ML		10-25' Silt; moist, yellow brown (10YR 5/4), trace fine sand and gravel, non-plastic
18'								Shale cobbles at 18', dark gray
25'			50					

Depth	Well Construction	Water Level	% Recovery	PID	Sample No.	USCS Code	Graphic Log	Material Description
25			50					25-30' Shale Boulder: hard, dark gray, oil smell
30			15			SH		30-35' Silt and Cobbles: dry, light gray to gray, non-plastic, dense
35			62			ML		35-43' Silt: moist, brown (7.5YR 5/4), trace fine sand and gravel, trace lean clay, non-plastic
40			90			ML		43-56' Silt: wet to saturated, yellowish brown (10YR 5/4), little fine sand and trace of gravel, non-plastic
45			1.6			ML		
50			0.4			ML		
55	100			100				

