EQUUS
Environmental, LLC

May 20, 2019

Dylan Rose-Coss
Hydrologist
New Mexico Oil Conservation Division
1220 South St. Francis Drive
Santa Fe, New Mexico 87505

Re: Fifth Annual Groundwater Monitoring Report
State L Lease (AP-73)
Lea County, New Mexico

Dear Mr. Rose-Coss:

Equus Environmental, LLC (Equus), on behalf of our client Chesapeake Energy Corporation (Chesapeake), is pleased to submit to the New Mexico Oil Conservation Division (NMOCD) in electronic format the ***Fifth Annual Groundwater Monitoring Report*** (Report) detailing the fifth year of groundwater monitoring activities conducted at the State L Lease Site (AP-73) located in the C-NE-NW of Section 19, Township 17 South, Range 36 East, Lea County, New Mexico. These activities were conducted in accordance with the Stage 2 Abatement Plan for the Site approved by the NMOCD on June 27, 2013.

If you have any questions or comments regarding this Report, please do not hesitate to contact me at (918) 906-6780.

Sincerely,
Equus Environmental, LLC

Bruce E. McKenzie, P.G.
Senior Principal

Enclosure: Fifth Annual Groundwater Monitoring Report

xc: Patrick McMahon - Heidel, Samberson, Newell, Cox & McMahon
Chase Acker - Chesapeake Energy

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FIFTH ANNUAL GROUNDWATER MONITORING REPORT
CHESAPEAKE ENERGY CORPORATION
STATE L LEASE (AP-73)
LEA COUNTY, NEW MEXICO

Prepared for:

Chesapeake Energy Corporation
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May 20, 2019

EQUUS
Environmental, LLC

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FIFTH ANNUAL GROUNDWATER MONITORING REPORT
CHESAPEAKE ENERGY CORPORATION
STATE L LEASE (AP-73)
LEA COUNTY, NEW MEXICO
MAY 20, 2019

1.0 INTRODUCTION

Chesapeake Energy Corporation (Chesapeake) retained Equus Environmental, LLC (Equus) to perform chloride and benzene impacted groundwater monitoring at Chesapeake's former State L Lease (Site) located in Lea County, New Mexico. The Site is located approximately 8 miles south-southwest of Lovington, New Mexico in the C-NE-NW quarter of Section 19, Township 17 South, Range 36 East, Lea County, New Mexico (coordinates 32.825319º latitude, -103.396361º longitude). The Site location and topographic features are shown on **Figure 1**. An oil and gas production tank battery was formerly located at the Site. Chesapeake purchased the Site in 2004, but never operated the tank battery. Chesapeake began abandonment and environmental investigation activities at the Site in 2007.

Initial Site investigation activities were conducted in May 2007. These investigation activities consisted of conducting EM-31 and EM-34 ground conductivity surveys, the collection of soil samples from nine boreholes, and the installation and sampling of five groundwater monitoring wells. Following the investigation in August 2007, Chesapeake submitted to the New Mexico Oil Conservation Division (NMOCD) a Stage 1 Abatement Plan for the Site. In May 2010, the NMOCD responded to Chesapeake that the agency was not adequately staffed to review the abatement plan in a timely manner and advised Chesapeake that they could proceed with abatement operations at risk. In July 2010, Chesapeake notified the NMOCD of their intent to proceed with the Stage 1 Abatement activities. On March 20, 2012, following implementation of these activities, Chesapeake submitted the Stage 1 Abatement Report for the Site.

On March 27, 2012, Chesapeake submitted to the NMOCD the ***Stage 2 Abatement Plan*** (Plan) for the Site. A copy of the Plan is provided in **Appendix A**. In this Plan, Chesapeake proposed the following abatement activities at the Site:

- Excavate and remove the near-surface soils at the Site containing concentrations of chloride exceeding 1,000 milligrams per kilogram (mg/kg),

- Excavate and remove the near-surface soils at the Site containing concentrations of TPH exceeding 1,000 mg/kg,
- Install clay liners in areas where chloride and/or TPH concentrations exceed 1,000 mg/kg at depths greater than five feet below ground level,
- Install one additional groundwater monitoring well downgradient of the Site,
- Monitor the groundwater at the Site until the concentrations of chloride and benzene are below the New Mexico Water Quality Control Commission standards.

On March 7, 2013, NMOCD notified Chesapeake that the Plan was administratively complete and that Chesapeake should proceed with public notice of the Plan. On March 30, 2013, Chesapeake published a notice of the proposed activities in the Albuquerque Journal, the Hobbs-Daily News Sun and the Lovington Leader. In addition, written notification of the Plan submittal was sent to all surface owners of record within a 1-mile radius of the Site. On June 27, 2013 upon completion of the notification activities, the NMOCD approved the Plan for the Site. A copy of the NMOCD correspondence approving the Plan is included in **Appendix B**.

The soil remediation activities outlined in the Plan were conducted at the Site during the period January 15, 2014 through March 27, 2014. The soil remediation activities were summarized in the document titled ***Soil Remediation Summary Report***, submitted to the NMOCD on August 6, 2014.

This ***Fifth Annual Groundwater Monitoring Report*** (Report) summarizes the groundwater monitoring activities conducted at the Site during the following quarterly sampling events:

- Seventeenth Event - June 5, 2018,
- Eighteenth Event - September 5, 2018,
- Nineteenth Event - December 11, 2018, and
- Twentieth Event - March 6, 2019.

2.0 QUARTERLY GROUNDWATER MONITORING

This Report describes the findings from four quarterly groundwater sampling events conducted at the Site from June 5, 2018 through March 6, 2019.

2.1 GROUNDWATER MONITORING METHODOLOGY

Prior to collecting groundwater samples during each quarterly event, Equus gauged all 6 monitoring wells (MW-1 through MW-6) at the Site using an electronic water level meter to determine the depth-to-water (DTW) within each monitoring well. The locations of these monitoring wells are shown on the attached **Figure 2**. DTWs were measured from the surveyed top-of-casing (TOC) of each well and converted to elevations relative to mean sea level. These data are presented in **Table 1**. Potentiometric surface maps were constructed utilizing these data to illustrate the groundwater flow direction within the shallow groundwater system beneath the Site. These potentiometric surface maps for each of the quarterly events are presented on **Figures 3** through **6**. As can be seen on the figures, groundwater flow at the Site is, in general, from the northwest to the southeast.

Upon completion of DTW measurement activities, Equus field personnel collected groundwater samples per the Plan. Chloride and benzene are the constituents of concern (COC) at the Site. The laboratory analytical results from these sampling events are screened against ***the New Mexico Administrative Code 20.6.2, Standards for Groundwater of 10,000 mg/L TDS Concentration or Less*** for chloride of 250 mg/L, and for benzene of 10 µg/L (Limits). According to the remediation goals set in the Plan, each program monitoring well is required to exhibit eight consecutive monitoring events where chloride is below the Limit of 250 mg/L. In addition, program monitoring well MW-4 is required to meet the same eight consecutive monitoring events criteria for benzene with a Limit of 10 µg/L. When these remediation goals are met, groundwater sampling activities at the Site will cease.

Historically, all monitoring wells at the Site have been sampled for chloride on a quarterly basis. In addition, monitoring well MW-4 has been sampled for benzene on a quarterly basis. It should be noted that monitoring well MW-2 (downgradient of monitoring well MW-4), was voluntarily sampled by Chesapeake for benzene from September 2014 through March 2018. Benzene has never been detected in any of the groundwater samples collected from monitoring well MW-2.

As recommended in the ***Fourth Annual Groundwater Monitoring Report***, dated May 14, 2018, groundwater samples were only collected from program monitoring well MW-4 for benzene analysis.

The groundwater samples from monitoring well MW-4 were collected utilizing EPA approved low-flow purging/sampling methodologies. Field parameters consisting of pH, specific conductivity, temperature, dissolved oxygen (DO), and oxidation reduction potential (ORP) were recorded during field activities utilizing an air-tight flow-through cell. Upon the stabilization of field parameters, groundwater samples were collected into laboratory prepared containers, labeled as to source and contents, placed on ice for preservation, placed under chain-of-custody control and shipped via overnight courier to the analytical laboratory (Test America Inc., Nashville, Tennessee). The groundwater samples collected from monitoring well MW-4 were analyzed for benzene (EPA Method 8260B) during each of the four quarterly events. A summary of the laboratory analytical results for benzene analyses is presented in **Table 2**, and complete copies of the laboratory analytical reports and chain-of-custody documentation is proved in **Appendix C**.

2.2 SEVENTEENTH QUARTERLY GROUNDWATER SAMPLING RESULTS

The seventeenth quarterly groundwater sampling event was conducted at the Site on June 5, 2018. As can be seen in **Table 2**, program monitoring well MW-4 exhibited a detectable concentration of benzene of 1.02 µg/L, which is well below the Limit of 10 µg/L.

2.3 EIGHTEENTH QUARTERLY GROUNDWATER SAMPLING RESULTS

The eighteenth quarterly groundwater sampling event was conducted at the Site on September 5, 2018. As can be seen in **Table 2**, program monitoring well MW-4 did not exhibited a detectable concentration of benzene at the laboratory's reporting limit.

2.4 NINETEENTH QUARTERLY GROUNDWATER SAMPLING RESULTS

The nineteenth quarterly groundwater sampling event was conducted at the Site on December 11, 2018. As can be seen in **Table 2**, program monitoring well MW-4 did not exhibited a detectable concentration of benzene at the laboratory's reporting limit.

2.5 TWENTIETH QUARTERLY GROUNDWATER SAMPLING RESULTS

The twentieth quarterly groundwater sampling event was conducted at the Site on March 6, 2019. As can be seen in **Table 2**, program monitoring well MW-4 exhibited a detectable concentration of benzene of 1.69 µg/L, which is well below the Limit of 10 µg/L.

2.6 BENZENE CONCENTRATION TREND IN MW-4

Figure 7 presents a benzene concentration trend graph for program monitoring well MW-4. A review of this figure indicates that the concentrations of benzene observed in the groundwater samples collected from this monitoring well have been variable since June 2014. Benzene has not been detected in the groundwater samples collected from monitoring well MW-4 at levels exceeding the Limit of 10 µg/L during the last five consecutive sampling events.

3.0 CONCLUSIONS

Based upon the data presented herein, the following conclusions are presented:

- Groundwater beneath the Site is encountered at depths ranging from approximately 47 to 49 feet below the surveyed tops-of-casing of the Site monitoring wells.

- The direction of groundwater flow at the Site is, in general, from the northwest to the southeast.

- During the reporting period, detectable concentrations of benzene were observed intermittently from the groundwater samples collected from program monitoring well MW-4 that were well below the Limit of 10 µg/L. Variable levels of benzene have been observed from groundwater samples collected from this monitoring well since 2014. A benzene concentration greater than the Limit has not been observed in monitoring well MW-4 since December 2017 (112 µg/L). Benzene concentrations greater than the Limit have not been observed in the groundwater samples collected from monitoring well MW-4 for five consecutive groundwater monitoring events.

4.0 RECOMMENDATIONS

Based upon a review of the data presented within this report, the following recommendations have been developed:

- The groundwater analytical data indicates that the levels of benzene observed in program monitoring well MW-4 are variable. The groundwater within this well should continue to be monitored on a quarterly basis for benzene. Monitoring for benzene will be discontinued when eight quarters of sample results indicate the benzene levels observed in this well are below the New Mexico Water Quality Control Commission standards. The next groundwater monitoring event at the Site is scheduled to be conducted in June 2019.

TABLES

Table 1 : Summary of Liquid Level Measurements
Chesapeake Energy Corporation, State L Lease (AP-73)
Lea County, New Mexico

Monitoring Well	Top of Casing Elevation (AMSL-Feet)	Depth to Liquid Measurement Date	Depth to LNAPL (Feet-TOC)	Depth to Groundwater (Feet-TOC)	LNAPL Thickness (Feet)	Groundwater Elevation (AMSL-Feet)
MW-1	3895.34	06/03/14	--	47.58	--	3847.76
	3895.34	09/22/14	--	47.66	--	3847.68
	3895.34	12/09/14	--	46.84	--	3848.50
	3895.34	03/10/15	--	47.27	--	3848.07
	3895.34	06/09/15	--	47.58	--	3847.76
	3895.34	09/01/15	--	47.75	--	3847.59
	3895.34	12/08/15	--	47.85	--	3847.49
	3895.34	03/08/16	--	47.89	--	3847.45
	3895.34	06/27/16	--	48.03	--	3847.31
	3895.34	09/20/16	--	48.11	--	3847.23
	3895.34	12/06/16	--	48.17	--	3847.17
	3895.34	03/07/17	--	48.27	--	3847.07
	3895.34	06/06/17	--	48.29	--	3847.05
	3895.34	09/06/17	--	48.42	--	3846.92
	3895.34	12/05/17	--	48.45	--	3846.89
	3895.34	03/06/18	--	48.55	--	3846.79
	3895.34	06/05/18	--	48.66	--	3846.68
	3895.34	09/05/18	--	48.70	--	3846.64
	3895.34	12/11/18	--	48.77	--	3846.57
	3895.34	03/06/19	--	48.90	--	3846.44
MW-2	3893.79	06/03/14	--	47.71	--	3846.08
	3893.79	09/22/14	--	47.82	--	3845.97
	3893.79	12/09/14	--	47.17	--	3846.62
	3893.79	03/10/15	--	47.42	--	3846.37
	3893.79	06/09/15	--	47.76	--	3846.03
	3893.79	09/01/15	--	47.91	--	3845.88
	3893.79	12/08/15	--	48.02	--	3845.77
	3893.79	03/08/16	--	48.04	--	3845.75
	3893.79	06/27/16	--	48.01	--	3845.78
	3893.79	09/20/16	--	48.26	--	3845.53
	3893.79	12/06/16	--	48.31	--	3845.48
	3893.79	03/07/17	--	48.39	--	3845.40
	3893.79	06/06/17	--	48.41	--	3845.38
	3893.79	09/06/17	--	48.57	--	3845.22
	3893.79	12/05/17	--	48.63	--	3845.16
	3893.79	03/06/18	--	48.71	--	3845.08
	3893.79	06/05/18	--	48.80	--	3844.99
	3893.79	09/05/18	--	48.90	--	3844.89
	3893.79	12/11/18	--	48.97	--	3844.82
	3893.79	03/06/19	--	49.06	--	3844.73
MW-3	3891.87	06/03/14	--	46.67	--	3845.20
	3891.87	09/22/14	--	46.78	--	3845.09
	3891.87	12/09/14	--	46.16	--	3845.71
	3891.87	03/10/15	--	46.44	--	3845.43
	3891.87	06/09/15	--	46.71	--	3845.16
	3891.87	09/01/15	--	46.84	--	3845.03
	3891.87	12/08/15	--	46.91	--	3844.96
	3891.87	03/08/16	--	46.96	--	3844.91

Table 1 : Summary of Liquid Level Measurements
Chesapeake Energy Corporation, State L Lease (AP-73)
Lea County, New Mexico

Monitoring Well	Top of Casing Elevation (AMSL-Feet)	Depth to Liquid Measurement Date	Depth to LNAPL (Feet-TOC)	Depth to Groundwater (Feet-TOC)	LNAPL Thickness (Feet)	Groundwater Elevation (AMSL-Feet)
MW-3 (con't)	3891.87	06/27/16	--	47.12	--	3844.75
	3891.87	09/20/16	--	47.21	--	3844.66
	3891.87	12/06/16	--	47.05	--	3844.82
	3891.87	03/07/17	--	47.32	--	3844.55
	3891.87	06/06/17	--	47.46	--	3844.41
	3891.87	09/06/17	--	45.50 *	--	3846.37
	3891.87	12/05/17	--	47.54	--	3844.33
	3891.87	03/06/18	--	47.63	--	3844.24
	3891.87	06/05/18	--	47.77	--	3844.10
	3891.87	09/05/18	--	47.82	--	3844.05
	3891.87	12/11/18	--	47.91	--	3843.96
	3891.87	03/06/19	--	48.00	--	3843.87
MW-4	3894.08	06/03/14	--	47.56	--	3846.52
	3894.08	09/22/14	--	47.65	--	3846.43
	3894.08	12/09/14	--	46.96	--	3847.12
	3894.08	03/10/15	--	47.32	--	3846.76
	3894.08	06/09/15	--	47.62	--	3846.46
	3894.08	09/01/15	--	47.74	--	3846.34
	3894.08	12/08/15	--	47.83	--	3846.25
	3894.08	03/08/16	--	47.90	--	3846.18
	3894.08	06/27/16	--	48.17	--	3845.91
	3894.08	09/20/16	--	48.41	--	3845.67
	3894.08	12/06/16	--	48.19	--	3845.89
	3894.08	03/07/17	--	48.25	--	3845.83
	3894.08	06/06/17	--	48.24	--	3845.84
	3894.08	09/06/17	--	48.41	--	3845.67
	3894.08	12/05/17	--	48.46	--	3845.62
	3894.08	03/06/18	--	48.54	--	3845.54
	3894.08	06/05/18	--	48.64	--	3845.44
	3894.08	09/05/18	--	48.69	--	3845.39
	3894.08	12/11/18	--	48.82	--	3845.26
	3894.08	03/06/19	--	48.91	--	3845.17
MW-5	3892.08	06/03/14	--	47.45	--	3844.63
	3892.08	09/22/14	--	46.56	--	3845.52
	3892.08	12/09/14	--	45.89	--	3846.19
	3892.08	03/10/15	--	46.27	--	3845.81
	3892.08	06/09/15	--	46.53	--	3845.55
	3892.08	09/01/15	--	46.62	--	3845.46
	3892.08	12/08/15	--	46.70	--	3845.38
	3892.08	03/08/16	--	46.77	--	3845.31
	3892.08	06/27/16	--	46.89	--	3845.19
	3892.08	09/20/16	--	47.02	--	3845.06
	3892.08	12/06/16	--	47.27	--	3844.81
	3892.08	03/07/17	--	47.11	--	3844.97
	3892.08	06/06/17	--	47.44	--	3844.64
	3892.08	09/06/17	--	47.00	--	3845.08
	3892.08	12/05/17	--	47.34	--	3844.74
	3892.08	03/06/18	--	47.41	--	3844.67
	3892.08	06/05/18	--	47.53	--	3844.55
	3892.08	09/05/18	--	47.58	--	3844.50
	3892.08	12/11/18	--	47.68	--	3844.40
	3892.08	03/06/19	--	47.77	--	3844.31

Table 1 : Summary of Liquid Level Measurements
Chesapeake Energy Corporation, State L Lease (AP-73)
Lea County, New Mexico

Monitoring Well	Top of Casing Elevation (AMSL-Feet)	Depth to Liquid Measurement Date	Depth to LNAPL (Feet-TOC)	Depth to Groundwater (Feet-TOC)	LNAPL Thickness (Feet)	Groundwater Elevation (AMSL-Feet)
MW-6	3892.09	06/03/14	--	47.43	--	3844.66
	3892.09	09/22/14	--	46.54	--	3845.55
	3892.09	12/09/14	--	45.92	--	3846.17
	3892.09	03/10/15	--	46.24	--	3845.85
	3892.09	06/09/15	--	46.50	--	3845.59
	3892.09	09/01/15	--	46.58	--	3845.51
	3892.09	12/08/15	--	46.69	--	3845.40
	3892.09	03/08/16	--	46.74	--	3845.35
	3892.09	06/27/16	--	46.88	--	3845.21
	3892.09	09/20/16	--	46.96	--	3845.13
	3892.09	12/06/16	--	47.01	--	3845.08
	3892.09	03/07/17	--	47.10	--	3844.99
	3892.09	06/06/17	--	47.13	--	3844.96
	3892.09	09/06/17	--	47.26	--	3844.83
	3892.09	12/05/17	--	47.31	--	3844.78
	3892.09	03/06/18	--	47.37	--	3844.72
	3892.09	06/05/18	--	47.52	--	3844.57
	3892.09	09/05/18	--	47.60	--	3844.49
	3892.09	12/11/18	--	47.70	--	3844.39
	3892.09	03/06/19	--	47.80	--	3844.29

Notes:

1. TOC : Measured from top of casing.
2. LNAPL : Light non aqueous phase liquid.
3. -- : Denotes Not Measured.
4. AMSL : Denotes above mean sea level (AMSL).
5. * Field measurement inconsistant with historical data set.

Table 2 : Summary of Laboratory Analytical Results for Groundwater Samples
Chesapeake Energy Corporation, State L Lease (AP-73)
Lea County, New Mexico

	Benzene (µg/L)																
	June 2014	September 2014	December 2014	March 2015	June 2015	September 2015	December 2015	March 2016	June 2016	September 2016	October 2016	December 2016	March 2017	June 2017	September 2017	December 2017	March 2018
MW-1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MW-2	---	<1.00	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	---	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
MW-3	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MW-4	**34.3**	4.76	**12.1**	<0.500	<0.500	<0.500	1.42	1.20	<0.500	**42.8**	9.74	1.53	**25.6**	<0.500	<0.500	**112**	3.84
MW-5	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MW-6	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

	Toluene (µg/L)																
	June 2014	September 2014	December 2014	March 2015	June 2015	September 2015	December 2015	March 2016	June 2016	September 2016	October 2016	December 2016	March 2017	June 2017	September 2017	December 2017	March 2018
MW-1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MW-2	---	---	<0.500	---	---	---	---	---	---	---	---	<0.500	---	---	---	---	<0.500
MW-3	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MW-4	---	---	<0.500	---	---	---	---	---	---	---	---	<0.500	---	---	---	---	<0.500
MW-5	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MW-6	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

	Ethylbenzene (µg/L)																
	June 2014	September 2014	December 2014	March 2015	June 2015	September 2015	December 2015	March 2016	June 2016	September 2016	October 2016	December 2016	March 2017	June 2017	September 2017	December 2017	March 2018
MW-1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MW-2	---	---	<0.500	---	---	---	---	---	---	---	---	<0.500	---	---	---	---	<0.500
MW-3	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MW-4	---	---	<0.500	---	---	---	---	---	---	---	---	<0.500	---	---	---	---	0.859
MW-5	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MW-6	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

	Xylenes (µg/L)																
	June 2014	September 2014	December 2014	March 2015	June 2015	September 2015	December 2015	March 2016	June 2016	September 2016	October 2016	December 2016	March 2017	June 2017	September 2017	December 2017	March 2018
MW-1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MW-2	---	---	<1.50	---	---	---	---	---	---	---	---	<1.00	---	---	---	---	<1.50
MW-3	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MW-4	---	---	<1.50	---	---	---	---	---	---	---	---	<1.00	---	---	---	---	<1.50
MW-5	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MW-6	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Table 2 : Summary of Laboratory Analytical Results for Groundwater Samples
Chesapeake Energy Corporation, State L Lease (AP-73)
Lea County, New Mexico

	Chloride (mg/L)																
	June 2014	September 2014	December 2014	March 2015	June 2015	September 2015	December 2015	March 2016	June 2016	September 2016	October 2016	December 2016	March 2017	June 2017	September 2017	December 2017	March 2018
MW-1	26.8	25.4	27.7	23.2	26.5	23.1	25.8	23.3	26.7	27.7	---	26.2	27.8	25.8	26.5	26.8	27.1
MW-2	**357**	**327**	**319**	**263**	**264**	**265**	247	243	229	208	---	210	196	197	220	187	185
MW-3	85.8	86.5	86.0	79.5	79.3	75.7	68.4	61.9	62.3	57.5	---	54.2	57.2	52.8	49.4	50.2	51.2
MW-4	192	239	**300**	238	**318**	**288**	**284**	200	193	181	150	132	118	91.9	113	147	171
MW-5	129	114	129	102	87.5	93.9	106	81.5	79.2	78.4	---	79.2	86.7	91.8	118	110	119
MW-6	133	167	149	160	146	148	147	148	154	164	---	160	162	170	180	154	153

Notes:

1. µg/L : micrograms per liter.
2. mg/L : milligrams per liter.
3. < : Analyte not detected at the laboratory reporting limit.
4. All analyses performed by TestAmerica Laboratories in Nashville, Tennessee.
5. Cells shaded in blue indicate results that are above the laboratory reporting limit.
6. Cells with text bolded indicate results exceed the New Mexico Administrative Code 20.6.2.3103, Standards for Groundwater: chloride (250.0 mg/L), benzene (10 µg/L), toluene (750 mg/L), ethylbenzene (750 mg/L), and xylenes (620 mg/L).
7. --- : Analysis not performed.
8. MW-4 resampled October 25, 2016 due to anomalous results from the September 2016 sampling event.

Table 2 : Summary of Laboratory Analytical Results for Groundwater Samples
Chesapeake Energy Corporation, State L Lease (AP-73)
Lea County, New Mexico

	Benzene (µg/L)			
	June 2018	September 2018	December 2018	March 2019
MW-1	---	---	---	---
MW-2	---	---	---	---
MW-3	---	---	---	---
MW-4	1.02	<0.500	<0.500	1.69
MW-5	---	---	---	---
MW-6	---	---	---	---

	Toluene (µg/L)			
	June 2018	September 2018	December 2018	March 2019
MW-1	---	---	---	---
MW-2	---	---	---	---
MW-3	---	---	---	---
MW-4	---	---	---	---
MW-5	---	---	---	---
MW-6	---	---	---	---

	Ethylbenzene (µg/L)			
	June 2018	September 2018	December 2018	March 2019
MW-1	---	---	---	---
MW-2	---	---	---	---
MW-3	---	---	---	---
MW-4	---	---	---	---
MW-5	---	---	---	---
MW-6	---	---	---	---

	Xylenes (µg/L)			
	June 2018	September 2018	December 2018	March 2019
MW-1	---	---	---	---
MW-2	---	---	---	---
MW-3	---	---	---	---
MW-4	---	---	---	---
MW-5	---	---	---	---
MW-6	---	---	---	---

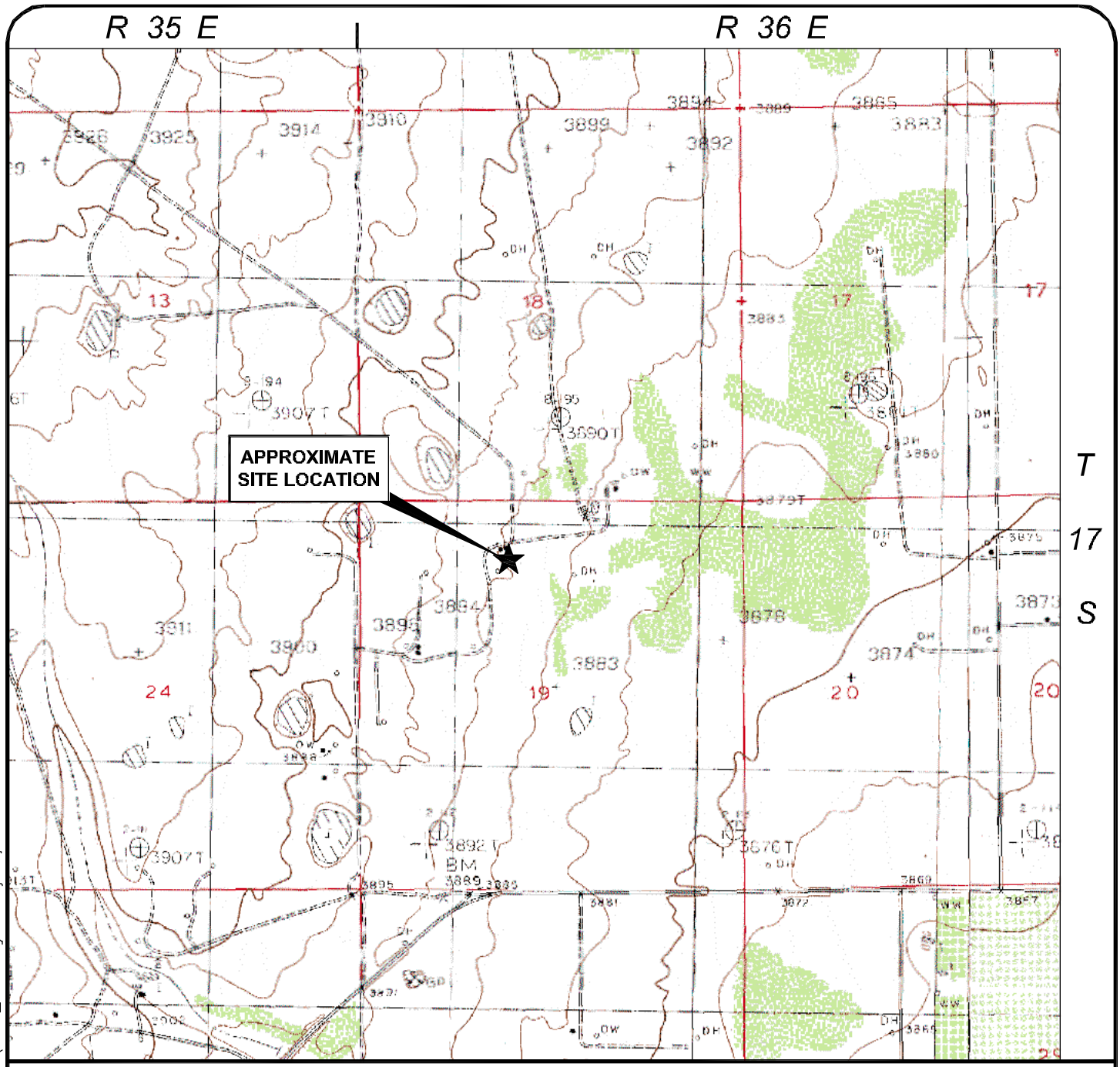
Table 2 : Summary of Laboratory Analytical Results for Groundwater Samples
Chesapeake Energy Corporation, State L Lease (AP-73)
Lea County, New Mexico

	Chloride (mg/L)			
	June 2018	September 2018	December 2018	March 2019
MW-1	---	---	---	---
MW-2	---	---	---	---
MW-3	---	---	---	---
MW-4	---	---	---	---
MW-5	---	---	---	---
MW-6	---	---	---	---

Notes:

1. µg/L : micrograms per liter.
2. mg/L : milligrams per liter.
3. < : Analyte not detected at the laboratory reporting limit.
4. All analyses performed by TestAmerica Laboratories in Nashville, Tennessee.
5. Cells shaded in blue indicate results that are above the laboratory reporting limit.
6. Cells with text bolded indicate results exceed the New Mexico Administrative Code 20.6.2.3103, Standards for Groundwater: chloride (250.0 mg/L), benzene (10 µg/L), toluene (750 mg/L), ethylbenzene (750 mg/L), and xylenes (620 mg/L).
7. --- : Analysis not performed.
8. MW-4 resampled October 25, 2016 due to anomalous results from the September 2016 sampling event.

FIGURES



SOURCE: U.S.G.S. 7.5 MINUTE TOPOGRAPHIC QUADRANGLES
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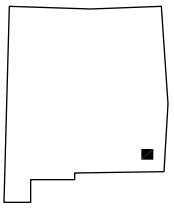
LOVINGTON SE, NEW MEXICO - PROVISIONAL EDITION 1985

NEW MEXICO



N

SCALE
0 1/2 1 MILE

CLIENT CHESAPEAKE ENERGY CORPORATION OKLAHOMA CITY, OKLAHOMA	FIGURE TITLE ***SITE LOCATION AND TOPOGRAPHIC FEATURES***
LOCATION STATE L LEASE (AP-73) SEC. 19, T17S, R36E, LEA COUNTY, NEW MEXICO	DOCUMENT TITLE FIFTH ANNUAL GROUNDWATER MONITORING REPORT

Equus Environmental, LLC
1323 East 71st Street, Suite 200
Tulsa, Oklahoma 74136-5065
918.921.5331
www.EQUUSENV.com

		DESIGNED BY	MNM
DATE	5/20/2019	APPROVED BY	MNM
SCALE	AS SHOWN	DRAWN BY	SKG
PROJECT NUMBER		FIGURE NUMBER	
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LEGEND

MW-5 — LOCATION OF MONITORING WELL

GRAVEL ROADWAY

PIPELINE

N

30 0 30 60

SCALE FEET

SOURCE: AERIAL PHOTOGRAPH DATED FEBRUARY 1, 2017, GOOGLE EARTH PRO SCREEN CAPTURE

EQUUS

1323 East 71st Street, Suite 200
Tulsa, Oklahoma 74136-5065
918.921.5331
www.EQUUSENV.com

DOCUMENT TITLE: FIFTH ANNUAL GROUNDWATER MONITORING REPORT

FIGURE TITLE: ***SITE BASE MAP***

CLIENT: CHESAPEAKE ENERGY CORPORATION, OKLAHOMA CITY, OKLAHOMA

LOCATION: STATE L LEASE (AP-73), SEC. 19, T17S, R36E, LEA COUNTY, NEW MEXICO

DESIGNED BY	MNM		
APPROVED BY	MNM	SCALE	1"=60'
DRAWN BY	SKG	DATE	5/20/2019

PROJECT NUMBER	FIGURE NUMBER
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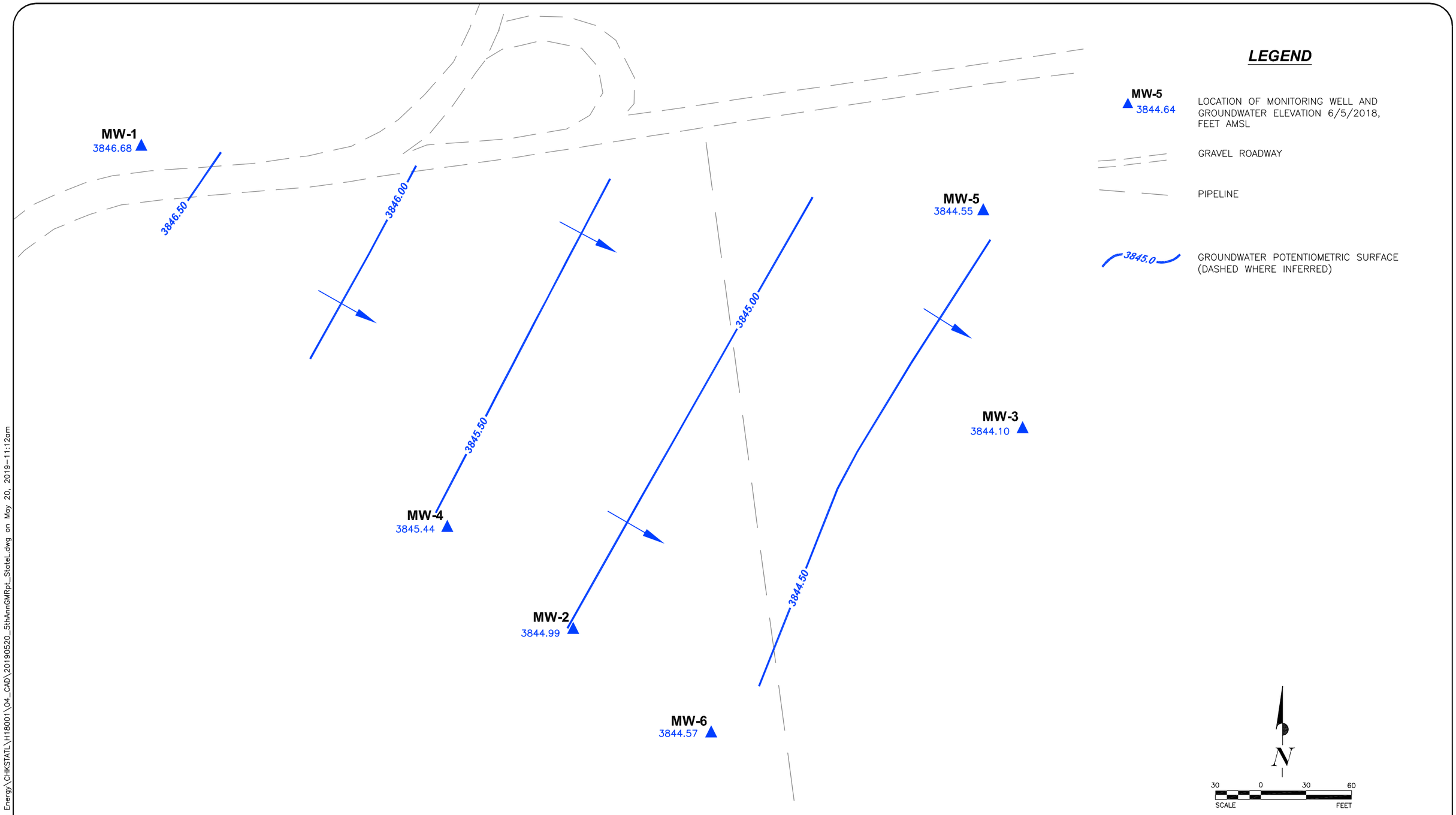

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Tulsa, Oklahoma 74136-5065
918.921.5331
www.EQUUSENV.com

DOCUMENT TITLE
FIFTH ANNUAL GROUNDWATER MONITORING REPORT

FIGURE TITLE
GROUNDWATER POTENTIOMETRIC SURFACE, JUNE 5, 2018

CLIENT CHESAPEAKE ENERGY CORPORATION
OKLAHOMA CITY, OKLAHOMA

LOCATION STATE L LEASE (AP-73)
SEC. 19, T17S, R36E, LEA COUNTY, NEW MEXICO

DESIGNED BY	MNM		
APPROVED BY	MNM	SCALE	1"=60'
DRAWN BY	SKG	DATE	5/20/2019

PROJECT NUMBER	FIGURE NUMBER
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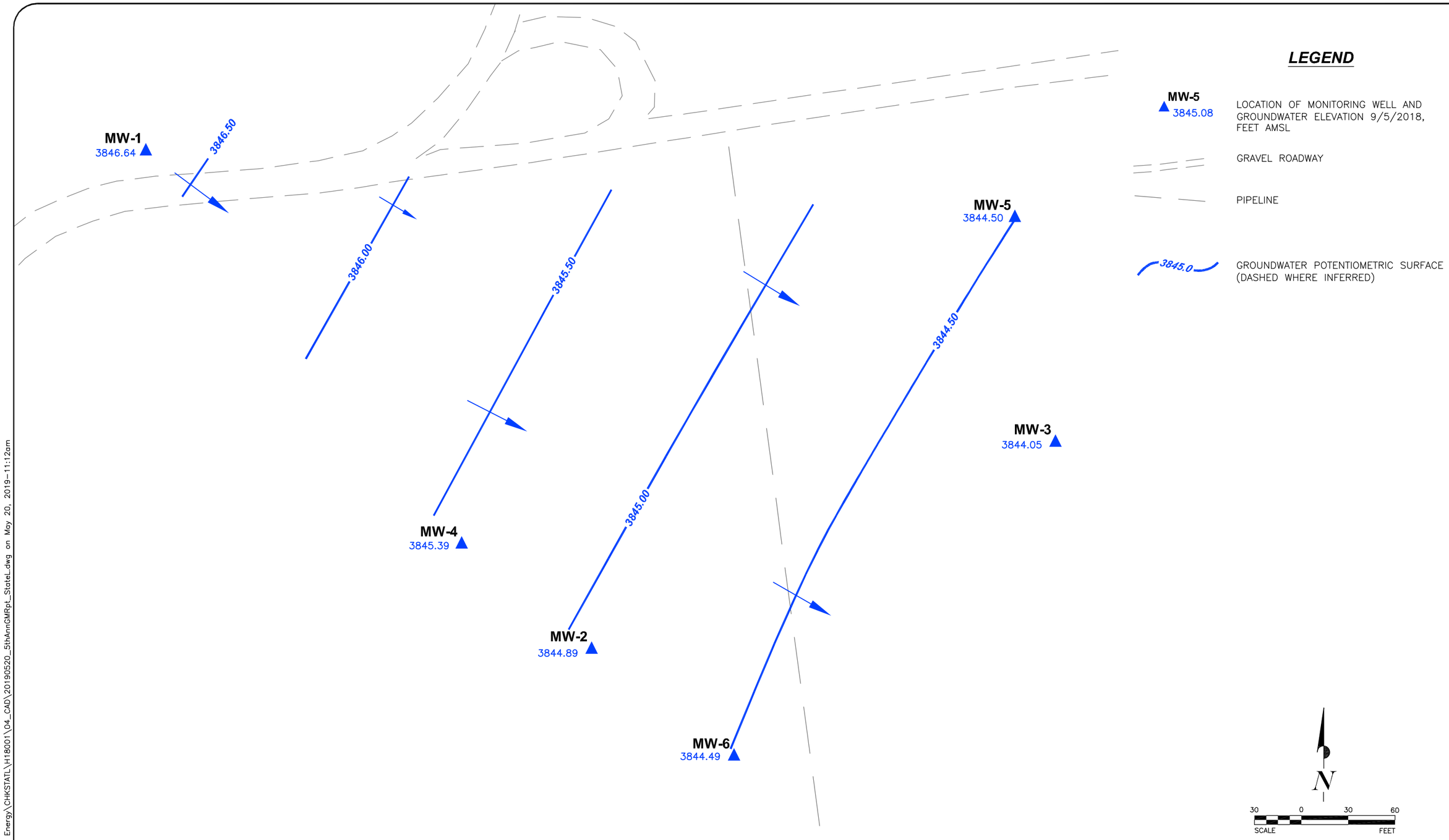

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Tulsa, Oklahoma 74136-5065
918.921.5331
www.EQUUSENV.com

DOCUMENT TITLE: FIFTH ANNUAL GROUNDWATER MONITORING REPORT

FIGURE TITLE: ***GROUNDWATER POTENTIOMETRIC SURFACE, SEPTEMBER 5, 2018***

CLIENT: CHESAPEAKE ENERGY CORPORATION
OKLAHOMA CITY, OKLAHOMA

LOCATION: STATE L LEASE (AP-73)
SEC. 19, T17S, R36E, LEA COUNTY, NEW MEXICO

DESIGNED BY	MNM		
APPROVED BY	MNM	SCALE	1"=60'
DRAWN BY	SKG	DATE	5/20/2019

PROJECT NUMBER	FIGURE NUMBER
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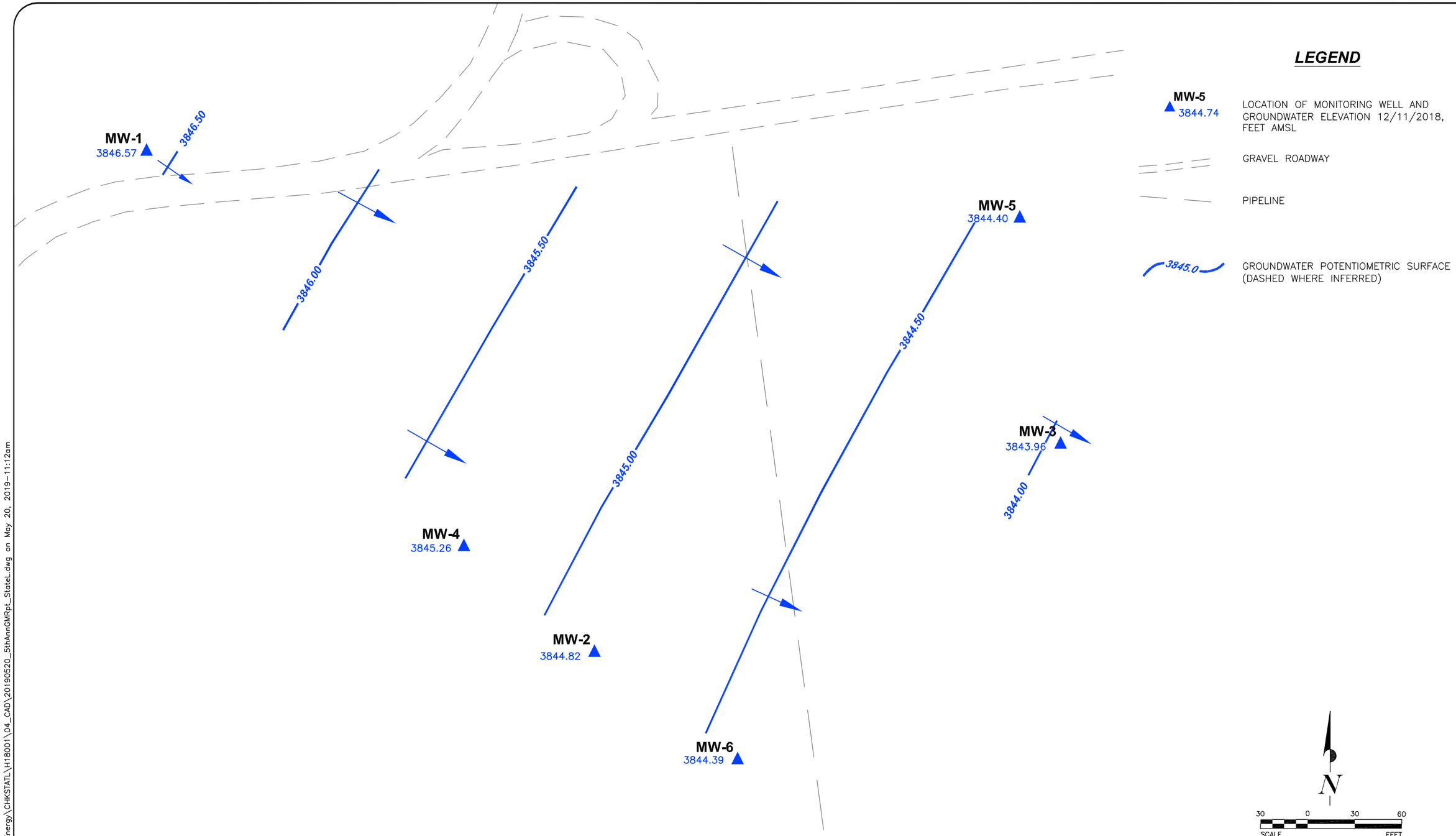

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Tulsa, Oklahoma 74136-5065
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www.EQUUSENV.com

DOCUMENT TITLE
FIFTH ANNUAL GROUNDWATER MONITORING REPORT

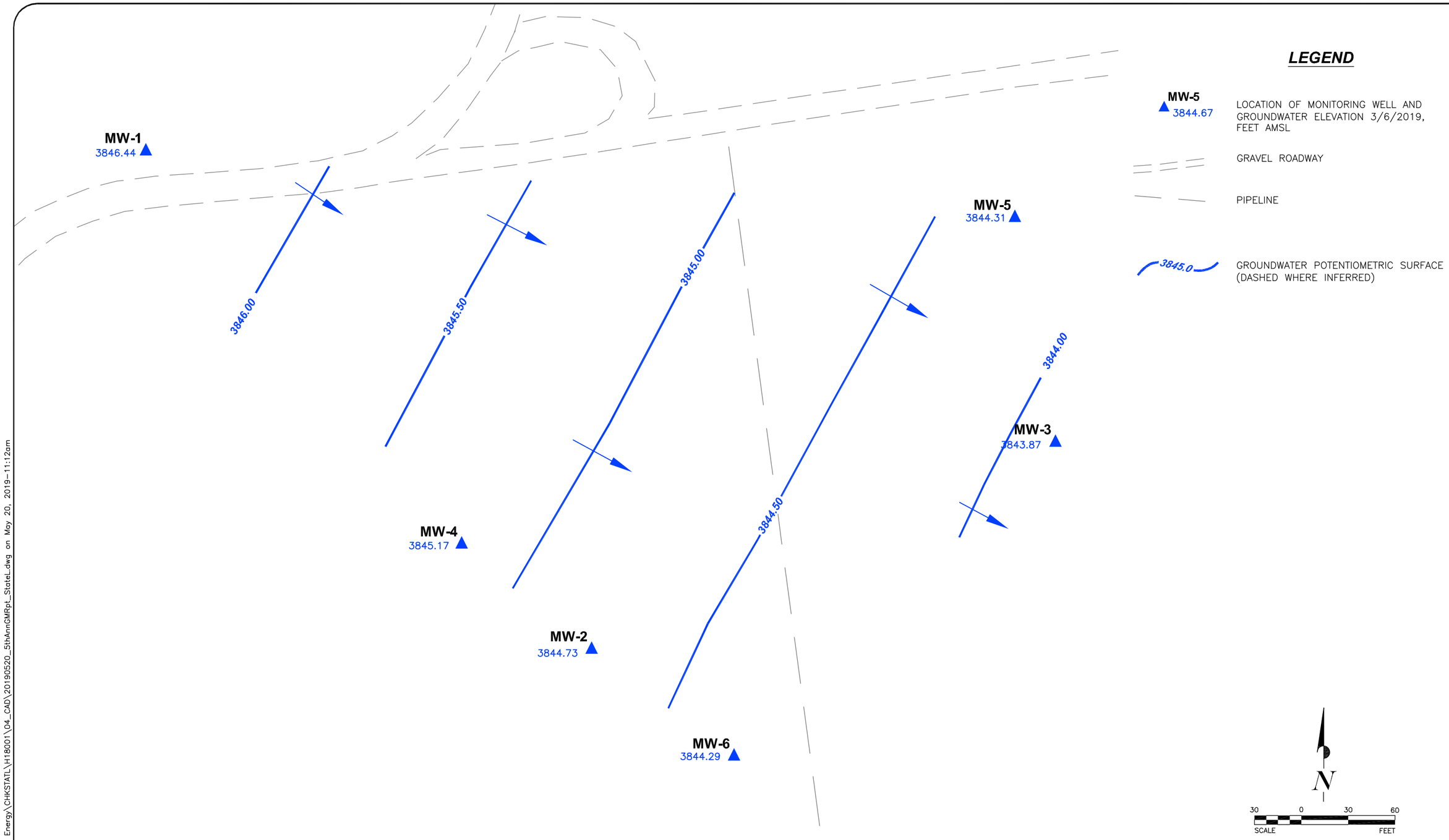
FIGURE TITLE
GROUNDWATER POTENTIOMETRIC SURFACE, DECEMBER 11, 2018

CLIENT CHESAPEAKE ENERGY CORPORATION
OKLAHOMA CITY, OKLAHOMA

LOCATION STATE L LEASE (AP-73)
SEC. 19, T17S, R36E, LEA COUNTY, NEW MEXICO

DESIGNED BY	MNM		
APPROVED BY	MNM	SCALE	1"=60'
DRAWN BY	SKG	DATE	5/20/2019

PROJECT NUMBER	FIGURE NUMBER
CHKSTATL:H18001	5



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1323 East 71st Street, Suite 200
Tulsa, Oklahoma 74136-5065
918.921.5331
www.EQUUSENV.com

DOCUMENT TITLE
FIFTH ANNUAL GROUNDWATER MONITORING REPORT

FIGURE TITLE
GROUNDWATER POTENTIOMETRIC SURFACE, MARCH 6, 2019

CLIENT
CHESAPEAKE ENERGY CORPORATION
OKLAHOMA CITY, OKLAHOMA

LOCATION
STATE L LEASE (AP-73)
SEC. 19, T17S, R36E, LEA COUNTY, NEW MEXICO

DESIGNED BY	MNM		
APPROVED BY	MNM	SCALE	1"=60'
DRAWN BY	SKG	DATE	5/20/2019

PROJECT NUMBER	FIGURE NUMBER
CHKSTATL:H18001	6

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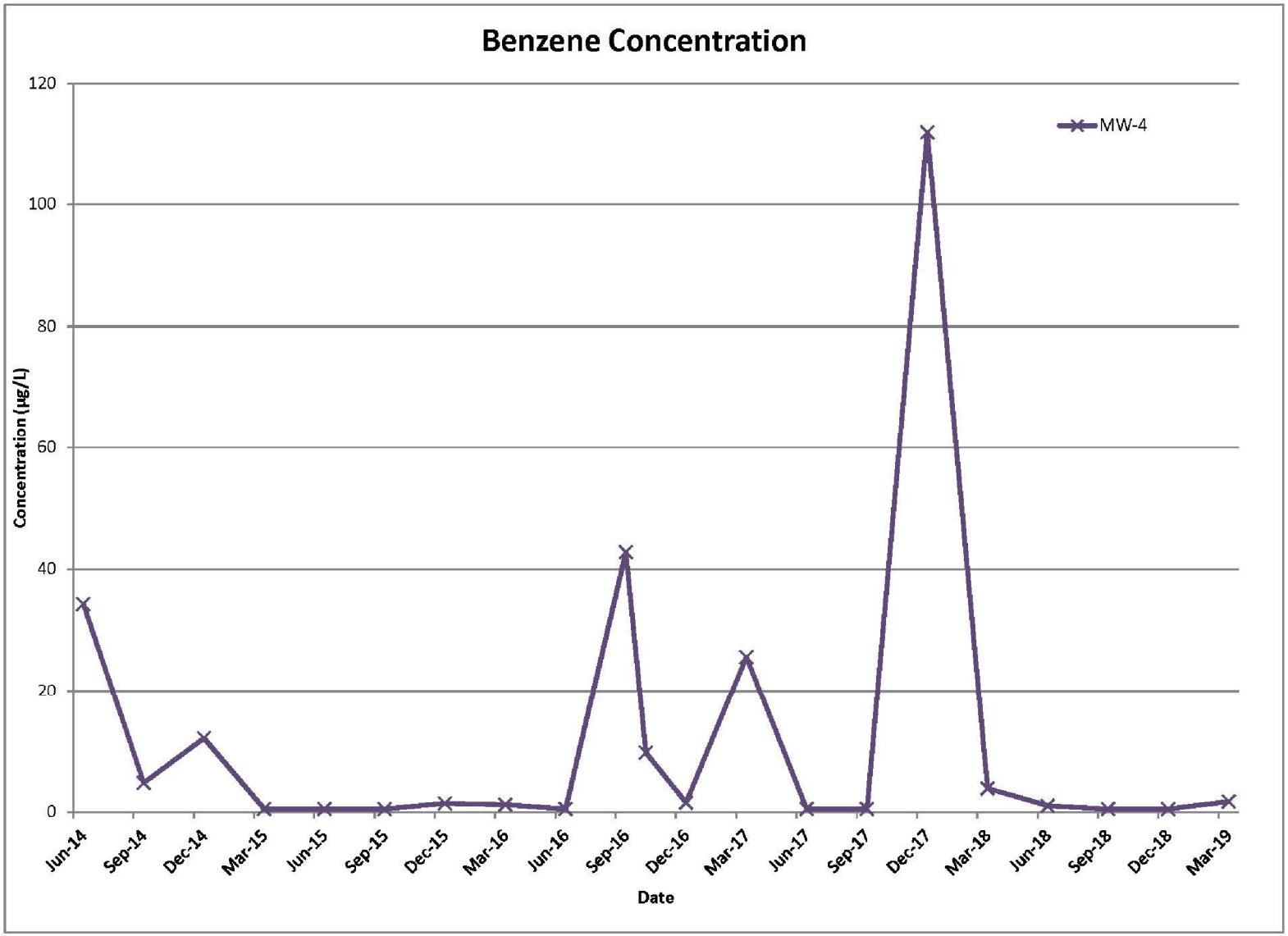

EQUUS Environmental, LLC
1323 East 71st Street, Suite 200
Tulsa, Oklahoma 74136-5065
918.921.5331
www.EQUUSENV.com

DOCUMENT TITLE
FIFTH ANNUAL GROUNDWATER MONITORING REPORT

FIGURE TITLE
MW-4 BENZENE CONCENTRATION TREND GRAPH

CLIENT
CHESAPEAKE ENERGY CORPORATION
OKLAHOMA CITY, OKLAHOMA

LOCATION
STATE L LEASE (AP-73)
SEC. 19, T17S, R36E, LEA COUNTY, NEW MEXICO

DESIGNED BY	CNA		
APPROVED BY	MNM	SCALE	NTS
DRAWN BY	SKG	DATE	5/20/2019

PROJECT NUMBER	FIGURE NUMBER
CHKSTATL:H18001	7

APPENDICES

A Stage 2 Abatement Plan

B NMOCD Approval of Stage 2 Abatement Plan

C Laboratory Analytical Reports and Chain-of-Custody Documentation

APPENDIX A

STAGE 2 ABATEMENT PLAN

ARCADIS
Infrastructure · Water · Environment · Buildings

ARCADIS U.S., Inc.
1004 North Big Spring Street
Suite 300
Midland
Texas 79701
Tel 432 687 5400
Fax 432 687 5401
www.arcadis-us.com

ENVIRONMENT

Mr. Glenn Von Gonten
New Mexico Oil Conservation Division
1220 South St. Francis Drive
Santa Fe, New Mexico 87505

Subject:
State L-2 AP-073
Stage 2 Abatement Plan

Date:
March 27, 2012

Dear Mr. Von Gonten:

On behalf of Chesapeake Energy Corporation, ARCCADIS U.S. Inc. respectfully submits the enclosed Stage 2 Abatement plan for the State L-2 site (AP-073). A Stage 1 Abatement Plan Report was submitted on March 20, 2012. Your review and approval of this Abatement Plan will be appreciated. The landowner, Darr Angell, is anxious for us to complete soil remediation at this site.

If you have any questions please do not hesitate to contact Bradley Blevins at (575) 391-1462 or via e-mail at bblevins@chkenergy or me at (432) 687-5400, e-mail address shall@aracdis-us.com.

Contact:
Sharon Hall

Phone:
432 687-5400

Email:
shall@aracdis-us.com

Our ref:
MT001088

ARCADIS U.S., Inc.
TX Engineering License # F-533

Sincerely,

ARCADIS U.S., Inc.

Sharon E. Hall
Associate Vice President

Copies:
Bradley Blevins- Chesapeake, Hobbs

ARCADIS
Infrastructure · Water · Environment · Buildings

Imagine the result

Chesapeake Energy Corporation

State L-2 AP-073

Stage 2 Abatement Plan Proposal

Hobbs, New Mexico

March 27, 2012

ARCADIS

Sharon E Hall

Sharon Hall
Associate Vice President

State L-2 AP-073

Stage 2 Abatement
Plan Proposal

Prepared for:
Chesapeake Energy
Corporation
Hobbs, New Mexico

Prepared by:
ARCADIS U.S., Inc.
1004 North Big Spring Street
Suite 300
Midland
Texas 79701
Tel 432 687 5400
Fax 432 687 5401

Our Ref.:
MT001088.0001.00001

Date:
March 27, 2012

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Figures

Appendices

ARCADIS

Chesapeake Energy Corporation
Hobbs, New Mexico

1. INTRODUCTION

The subject site is a former tank battery site located east of Buckeye, New Mexico. The site was purchased by Chesapeake Energy Corporation (Chesapeake) in April 2004. Chesapeake did not operate the tank battery or the associated well field and began the process of facility abandonment in 2007.

Five monitor wells and nine soil borings have been drilled at the site. Elevated chloride concentrations and limited hydrocarbon compounds were detected in soil samples collected from soil borings and monitoring wells.

2. SUMMARY OF STAGE 1 ABATEMENT ACTIVITIES

Initial site investigation activities were conducted in May of 2007 following abandonment of the tank battery. Stage 1 Abatement activities were conducted during the period of May 2007 through September 2011. Stage 1 Abatement activities included drilling and soil sampling of nine boreholes, drilling and sampling of seven monitor wells, EM 31 and EM 34 surveys, conversion of one monitoring well into a recovery well and recovery of phase-separated hydrocarbons from the recovery well.

New Mexico Oil Conservation Division (NMOCD) was notified of impacts to groundwater at the site via e-mail on May 30, 2007. NMOCD notified Chesapeake in a letter dated June 19, 2007 that a Stage 1 Abatement Plan was required for the site in accordance with Rule 19.

The Stage 1 Abatement Plan was submitted to NMOCD on August 22, 2007. The plan summarized site activities taken to date. The plan proposed the drilling and sampling of a minimum of three additional soil borings and installation and sampling of nine groundwater monitoring wells.

BBC contacted NMOCD via email on April 24, 2010 to inquire about the status of the Stage 1 Abatement Plan approval and Chesapeake's desire to conduct the proposed Stage 1 Abatement Plan activities. On May 27, 2010, NMOCD responded via email that the State was not staffed to review the Abatement Plans (APs) in a timely manner. On June 23, 2010, BBC contacted NMOCD via email to request a waiver of the Public Notice requirement and inform NMOCD that Chesapeake and the landowner were anxious to move forward with the proposed AP activities. NMOCD replied via email on June 23, 2010 stating they were still understaffed to review the AP and could not waive the Public Notice requirement. They advised BBC that Chesapeake could proceed "at

risk." On July 12, 2010 BBC informed NMOCD by registered letter that Chesapeake was planning to start the Stage 1 Assessment on or about August 23, 2010. They further informed NMOCD they would be submitting the required Public Notices, a copy of which was attached to the letter. NMOCD did not respond to the registered letter.

The public notices were published in the Hobbs News-Sun and Lovington Leader on July 22, 2010 and the Albuquerque Journal on July 24, 2010. No comments were received from the public or NMOCD during the 30-day comment period and Chesapeake proceeded with the proposed Stage 1 Abatement Plan activities on August 26, 2010. Copies of correspondence and Public Notice are included in Appendix A.

A detailed description of site activities and results can be found in the report submitted to NMOCD dated March 20, 2012 entitled State L-2 AP-073, Stage 1 Abatement Report (Site Assessment Investigation). Analytical results for soil and groundwater sampling are summarized on Figure 1.

3. STAGE 2 ABATEMENT PLAN PROPOSAL

After review of various remedial options, we propose the following Stage 2 Abatement Plan. The plan addresses soil and groundwater remediation.

3.1 Soil Remediation

The selected remedial option will be the excavation of near-surface soils and installation of clay liners. The anticipated extent and depth of excavation is based on assessment activities (laboratory analysis and visual observation) and is shown in Figure 2. Near surface soils (to a depth of 5 feet below ground surface) with chloride concentrations in excess of 1,000 milligrams per kilogram (mg/kg) and a Total Petroleum Hydrocarbons (TPH) concentration in excess of 1,000 mg/kg will be excavated and disposed. Excavated soils will be disposed at Lea Land Landfill.

Areas where chloride or TPH concentrations are expected to exceed 1,000 mg/kg at depths greater than 5 feet below ground surface soils will be excavated to a depth of 5 feet below ground surface. The area surrounding SB-1 will be excavated to a depth of 2 feet below ground surface. Subsurface chloride impacted soils are not evidenced in this area and elevated TPH concentrations at depth are not likely to inhibit growth of

vegetation. Soils will be screened in the field for chlorides using chloride field test kits and for TPH using a photoionization. Critical samples (samples used to delineate the excavations) will be submitted for laboratory analysis of chlorides and/or TPH. Following excavation, a 12-inch compacted clay layer that meets or exceeds a permeability of equal to or less than 1 x 10^{-8} centimeters per second will be installed in the excavations. The lined excavations will be backfilled with four feet of locally obtained native soil. All of the excavated areas will be re-seeded with native vegetation. Areas that are supporting vegetation will not be disturbed.

Use of the USEPA Multi-Med model demonstrates that the clay liners will mitigate the leaching of chlorides to groundwater. The model predicts that after 7000 years of infiltration through the liner the maximum concentration of chlorides in groundwater will be 150 milligrams per liter (mg/L). The Multi-Med inputs and outputs are included in Appendix A.

3.2 Groundwater Monitoring

One additional groundwater monitoring well will be installed downgradient of the site. The monitoring well will be designated MW-6.

Groundwater samples will be collected from all of the monitoring wells and analyzed for chlorides using USEPA method 9056 for each of four quarters. Groundwater samples from MW-4 will also be analyzed for benzene. Based on sample results for one year (four quarters), sampling frequency will be reviewed and may be revised.

Sampling will be discontinued when eight quarters of sample results indicate chloride and benzene concentrations are below New Mexico Water Quality Control Commission, Title 20, Chapter 6, Part 2 standards. Sample results will be submitted to the NMOCD annually on June 15.

Proposed groundwater remediation is presented in Sections 3.3.

3.3 Groundwater Remediation

Chloride concentrations in groundwater exceed New Mexico Water Quality Control Commission standards in three wells (MW-2, 580 mg/L; MW-4, 548 mg/L and MW-5, 280 mg/L). Benzene concentrations exceed New Mexico Water Quality Control Commission standards in monitoring well MW-4 at a concentration of 0.224 mg/L.

Removal of near-surface soils that are a potential source of chlorides and hydrocarbons in groundwater and lining of excavations with chloride and TPH concentrations in excess of 1,000 mg/kg will mitigate leaching of chlorides to groundwater. Considering the relatively low concentrations of chlorides in groundwater and the fact that soil removal and clay liner infiltration barrier installation will be conducted at this site, we propose monitoring the site for a period of two years before considering pumping of groundwater at this site. With the proposed source removal and mitigation and the severe drought conditions being experienced in this area, we believe it prudent to evaluate if chloride mass removal by pumping is warranted at this site.

4. PUBLIC NOTIFICATION

Written notification of submittal of the Stage 2 Abatement Plan Proposal and site activities will be sent to all surface owners of record within a one-mile radius of the site. NMOCD will be supplied with a list of parties to be notified. Publication of notice of activities will be published in a state-wide circulated newspaper, the Albuquerque Journal, and two county newspapers, the Hobbs-Daily News Sun and the Lovington Leader.

5. REMEDIATION WORK SCHEDULE

Soil remediation activities are expected to be completed in 15 working days (Monday through Friday). Groundwater remediation activities will be ongoing. An estimated completion date for groundwater remediation is not available.

6. REFERENCES

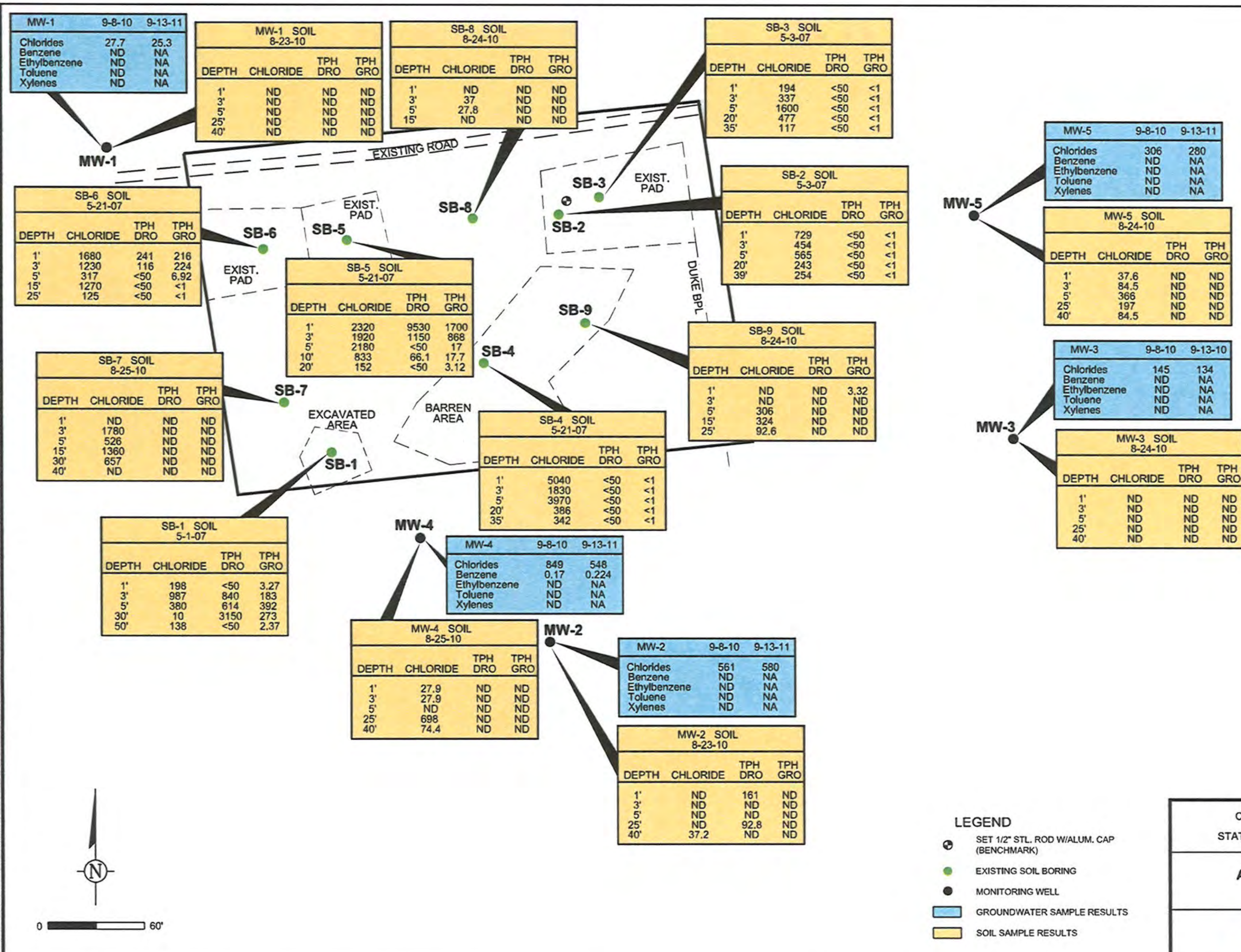
Groundwater Handbook; United States Environmental Protection Agency, Office of Research and Development, Center for Environmental Research Information; 1992

New Mexico Water Quality Control Commission, Title 20 Chapter 6, Part 2, Subpart I

State L-2 AP-073 Stage 1 Abatement Report (Site Assessment Investigation); ARCADIS; March 2012

State L-2 Salt Water Disposal Tank Battery, Stage 1 Abatement Plan (Ap-072), BBC International; August 2007

New Mexico Water Quality Control Commission, Title 20 Chapter 6, Part 2, Subpart I



MW-1	9-8-10	9-13-11
Chlorides	27.7	25.3
Benzene	ND	NA
Ethylbenzene	ND	NA
Toluene	ND	NA
Xylenes	ND	NA

MW-1 SOIL 8-23-10

DEPTH	CHLORIDE	TPH DRO	TPH GRO
1'	ND	ND	ND
3'	ND	ND	ND
5'	ND	ND	ND
25'	ND	ND	ND
40'	ND	ND	ND

SB-8 SOIL 8-24-10

DEPTH	CHLORIDE	TPH DRO	TPH GRO
1'	ND	ND	ND
3'	37	ND	ND
5'	27.8	ND	ND
15'	ND	ND	ND

SB-3 SOIL 5-3-07

DEPTH	CHLORIDE	TPH DRO	TPH GRO
1'	194	<50	<1
3'	337	<50	<1
5'	1600	<50	<1
20'	477	<50	<1
35'	117	<50	<1

SB-2 SOIL 5-3-07

DEPTH	CHLORIDE	TPH DRO	TPH GRO
1'	729	<50	<1
3'	454	<50	<1
5'	565	<50	<1
20'	243	<50	<1
39'	254	<50	<1

SB-6 SOIL 5-21-07

DEPTH	CHLORIDE	TPH DRO	TPH GRO
1'	1680	241	216
3'	1230	116	224
5'	317	<50	6.92
15'	1270	<50	<1
25'	125	<50	<1

SB-5 SOIL 5-21-07

DEPTH	CHLORIDE	TPH DRO	TPH GRO
1'	2320	9530	1700
3'	1920	1150	868
5'	2180	<50	17
10'	833	66.1	17.7
20'	152	<50	3.12

SB-7 SOIL 8-25-10

DEPTH	CHLORIDE	TPH DRO	TPH GRO
1'	ND	ND	ND
3'	1780	ND	ND
5'	526	ND	ND
15'	1360	ND	ND
30'	657	ND	ND
40'	ND	ND	ND

SB-9 SOIL 8-24-10

DEPTH	CHLORIDE	TPH DRO	TPH GRO
1'	ND	ND	3.32
3'	ND	ND	ND
5'	306	ND	ND
15'	324	ND	ND
25'	92.6	ND	ND

SB-4 SOIL 5-21-07

DEPTH	CHLORIDE	TPH DRO	TPH GRO
1'	5040	<50	<1
3'	1830	<50	<1
5'	3970	<50	<1
20'	386	<50	<1
35'	342	<50	<1

SB-1 SOIL 5-1-07

DEPTH	CHLORIDE	TPH DRO	TPH GRO
1'	198	<50	3.27
3'	987	840	183
5'	380	614	392
30'	10	3150	273
50'	138	<50	2.37

MW-4	9-8-10	9-13-11
Chlorides	849	548
Benzene	0.17	0.224
Ethylbenzene	ND	NA
Toluene	ND	NA
Xylenes	ND	NA

MW-4 SOIL 8-25-10

DEPTH	CHLORIDE	TPH DRO	TPH GRO
1'	27.9	ND	ND
3'	27.9	ND	ND
5'	ND	ND	ND
25'	698	ND	ND
40'	74.4	ND	ND

MW-2	9-8-10	9-13-11
Chlorides	561	580
Benzene	ND	NA
Ethylbenzene	ND	NA
Toluene	ND	NA
Xylenes	ND	NA

MW-2 SOIL 8-23-10

DEPTH	CHLORIDE	TPH DRO	TPH GRO
1'	ND	161	ND
3'	ND	ND	ND
5'	ND	ND	ND
25'	ND	92.8	ND
40'	37.2	ND	ND

MW-5	9-8-10	9-13-11
Chlorides	306	280
Benzene	ND	NA
Ethylbenzene	ND	NA
Toluene	ND	NA
Xylenes	ND	NA

MW-5 SOIL 8-24-10

DEPTH	CHLORIDE	TPH DRO	TPH GRO
1'	37.6	ND	ND
3'	84.5	ND	ND
5'	366	ND	ND
25'	197	ND	ND
40'	84.5	ND	ND

MW-3	9-8-10	9-13-10
Chlorides	145	134
Benzene	ND	NA
Ethylbenzene	ND	NA
Toluene	ND	NA
Xylenes	ND	NA

MW-3 SOIL 8-24-10

DEPTH	CHLORIDE	TPH DRO	TPH GRO
1'	ND	ND	ND
3'	ND	ND	ND
5'	ND	ND	ND
25'	ND	ND	ND
40'	ND	ND	ND

LEGEND

- SET 1/2" STL. ROD W/ALUM. CAP (BENCHMARK)
- EXISTING SOIL BORING
- MONITORING WELL
- GROUNDWATER SAMPLE RESULTS
- SOIL SAMPLE RESULTS

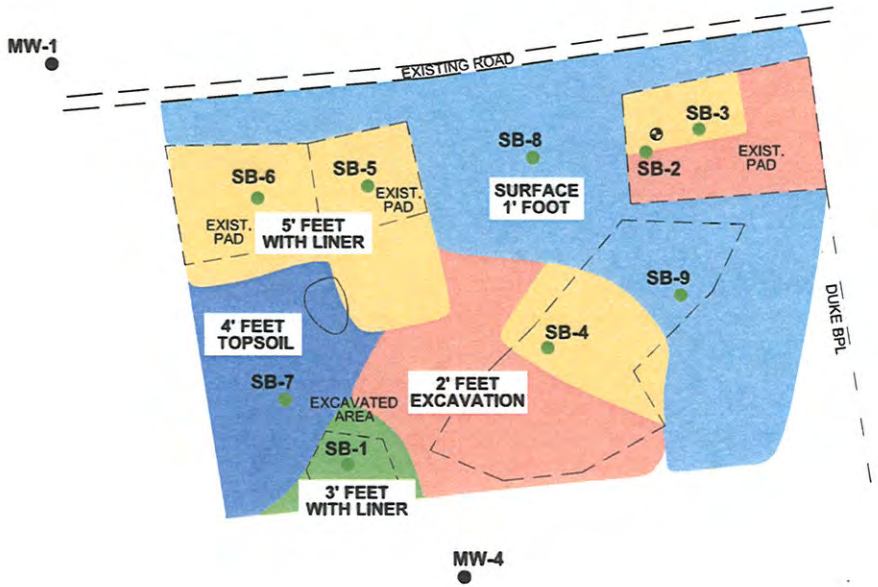
CHESAPEAKE ENERGY CORPORATION
HOBBS, NEW MEXICO
STATE L-2 AP-073 STAGE 2 ABATEMENT PLAN

SOIL & GROUNDWATER ANALYTE CONCENTRATIONS (Milligrams Per Kilogram & Milligrams Per Liter)

ARCADIS

FIGURE 1

CITY: DIV/GROUP: DB: LD: AM: PD: TM: TR: LYR:ON=*;OFF=*REF*
G:\User Folders\Diana\MIDLAND-WORK\Sharon Hall\March 2012\State L-2\Figure 1 Soil & GW Analyte COC (L-2).dwg LAYOUT: MODEL SAVED: 3/19/2012 1:11 PM ACADVER: 18.0S (LMS TECH) PAGESETUP: — PLOTSTYLETABLE: — PLOTTED: 3/19/2012 3:44 PM BY: LEASE DIANA



MW-5

MW-3

MW-2

LEGEND

- SET 1/2" STL. ROD W/ALUM. CAP (BENCHMARK)
- EXISTING SOIL BORING
- MONITORING WELL
- SURFACE
- 2' FEET
- 3' FEET
- 4' FEET
- 5' FEET

N

0 60'

CHESAPEAKE ENERGY CORPORATION
HOBBS, NEW MEXICO
STATE L-2 AP-073 STAGE 2 ABATEMENT PLAN

PROPOSED EXCAVATION MAP

ARCADIS

FIGURE 2

CITY: DIVGROUP: DB: LD: MK: PD: TM: TR: LYRON=*OFF*REF*
G:\User Folders\Dana\MIDLAND-WORK\Stevon Hall\March 2012\State L-2\Figure 2 Prog Excav (L-2).dwg LAYOUT: MODEL SAVED: 3/19/2012 2:29 PM ACADVER: 18.0S (LMS TECH) PAGESETUP: — PLOTSTYLETABLE: — PLOTTED: 3/19/2012 3:45 PM BY: LEASE, DANA

ARCADIS

Appendix A

Multi-Med Model Inputs and Outputs

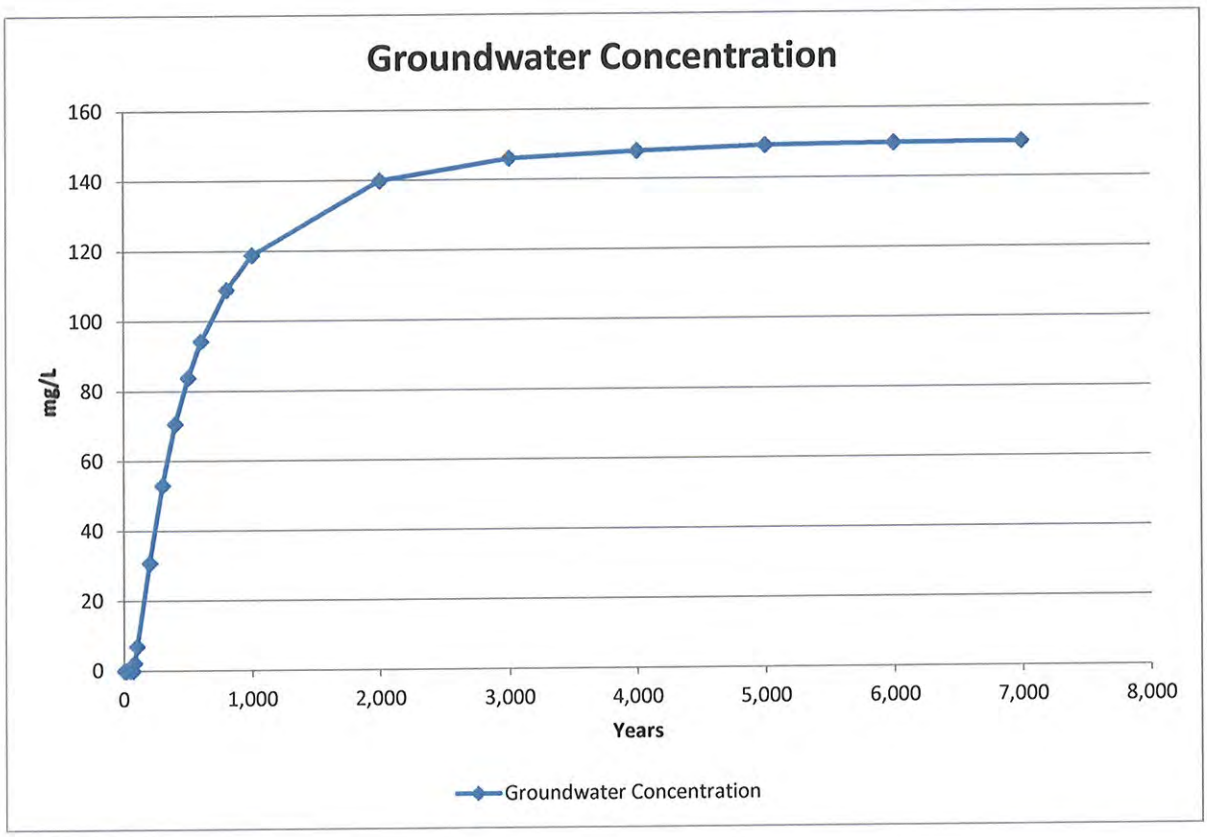
Chesapeake State L-2
Chesapeake Energy Corporation
Buckeye, Lea County, New Mexico
Multimed Model Input and Output (With Liner)

MODEL INPUT AND OUTPUT						MODEL RANGE	
INPUT PARAMETERS						Minimum	Maximum
Unsaturated Zone Flow Parameters							
Depth of Unsaturated Zone	m	46	feet	14.0	m	0.000000001	None
Hydraulic Conductivity	cm/hr	2	ft/day	2.54	cm/hr	0.00000000001	10,000
Unsaturated Zone Porosity	fraction	0.05	fraction	0.05	fraction	0.000000001	0.99
Residual Water Content	fraction	0.01	fraction	0.010	fraction	0.000000001	1
Unsaturated Zone Transport Parameters							
Thickness of Layer	m	46	feet	14.0	m	0.000000001	None
Percent of Organic Matter	%	2.6	%	2.6	%	0	100
Bulk Density	g/cm^3	1.35	g/cm^3	1.35	g/cm^3	0.01	5
Biological Decay Coefficient	1/yr	0	1/yr	0	1/yr	0	None
Aquifer Parameters							
Aquifer Porosity	fraction	0.25	fraction	0.25	fraction	0.000000001	0.99
Bulk Density	g/cm^3	1.35	g/cm^3	1.35	g/cm^3	0.01	5
Aquifer Thickness	m	15	ft	4.6	m	0.000000001	100,000
Hydraulic Conductivity	m/yr	2	ft/day	223	m/yr	0.0000001	100,000,000
Hydraulic Gradient	m/m	0.004	m/m	0.004	m/m	0.00000001	None
Organic Carbon Content	fraction	0.00315	fraction	0.00315	fraction	0.000001	1
Temperature of Aquifer	°C	14.4	°C	14.4	°C	0.00000001	None
pH		6.2		6.2		0.3	14
x-distance Radial Distance from Site to Receptor	m	1	m	1	m	1	None
Source Parameters							
Infiltration Rate from the Facility	m/yr	0.05	in/yr	0.0013	m/yr	0.0000000001	10,000,000,000
Area of Waste Disposal Unit	m^2	52,650	ft^2	4891	m^2	0.01	None
Length Scale of Facility	m	270	feet	82.3	m	0.000000001	10,000,000,000
Width Scale of Facility	m	195	feet	59.4	m	0.000000001	10,000,000,000
Recharge Rate into the Plume	m/yr	0	in/yr	0	m/yr	0	10,000,000,000
Duration of Pulse	yr	7,000	yr	7000	yr	0.000000001	None
Initial Concentration at Landfill	mg/L	5,040	mg/L	5,040	mg/L	0	None
Additional Parameters							
Method				Gaussian		Gaussian	Patch
Name of Chemical Specified				Chloride			

MODEL OUTPUT			
Final Concentration at Landfill	mg/L	150.0	mg/L

MODEL OUTPUT				
Concentration at Landfill	0.0 mg/L	Time	1	yr
	0.0 mg/L		10	yr
	0.0 mg/L		20	yr
	0.0 mg/L		50	yr
	0.0 mg/L		70	yr
	2.2 mg/L		80	yr
	6.9 mg/L		100	yr
	30.8 mg/L		200	yr
	53.0 mg/L		300	yr
	70.6 mg/L		400	yr
	83.8 mg/L		500	yr
	94.3 mg/L		600	yr
	108.9 mg/L		800	yr
	118.8 mg/L		1,000	yr
	139.9 mg/L		2,000	yr
	146.1 mg/L		3,000	yr
	148.0 mg/L		4,000	yr
	149.3 mg/L		5,000	yr
	149.8 mg/L		6,000	yr
	150.0 mg/L		7,000	yr

Chesapeake State L-2
Chesapeake Energy Corporation
Buckeye, Lea County, New Mexico



Chesapeake State L-2
Chesapeake Energy Corporation
Buckeye, Lea County, New Mexico
Multimed Model Input and Output (Without Liner)

MODEL INPUT AND OUTPUT						MODEL RANGE	
INPUT PARAMETERS						Minimum	Maximum
Unsaturated Zone Flow Parameters							
Depth of Unsaturated Zone	m	46	feet	14.0	m	0.000000001	None
Hydraulic Conductivity	cm/hr	2	ft/day	2.54	cm/hr	0.00000000001	10,000
Unsaturated Zone Porosity	fraction	0.05	fraction	0.05	fraction	0.000000001	0.99
Residual Water Content	fraction	0.01	fraction	0.010	fraction	0.000000001	1
Unsaturated Zone Transport Parameters							
Thickness of Layer	m	45	feet	13.7	m	0.000000001	None
Percent of Organic Matter	%	2.6	%	2.6	%	0	100
Bulk Density	g/cm^3	1.35	g/cm^3	1.35	g/cm^3	0.01	5
Biological Decay Coefficient	1/yr	0	1/yr	0	1/yr	0	None
Aquifer Parameters							
Aquifer Porosity	fraction	0.25	fraction	0.25	fraction	0.000000001	0.99
Bulk Density	g/cm^3	1.35	g/cm^3	1.35	g/cm^3	0.01	5
Aquifer Thickness	m	15	ft	4.6	m	0.000000001	100,000
Hydraulic Conductivity	m/yr	2	ft/day	223	m/yr	0.0000001	100,000,000
Hydraulic Gradient	m/m	0.006	m/m	0.006	m/m	0.00000001	None
Organic Carbon Content	fraction	0.00315	fraction	0.00315	fraction	0.000001	1
Temperature of Aquifer	°C	14.4	°C	14.4	°C	0.00000001	None
pH		6.2		6.2		0.3	14
x-distance Radial Distance from Site to Receptor	m	1	m	1	m	1	None
Source Parameters							
Infiltration Rate from the Facility	m/yr	1.50	in/yr	0.0381	m/yr	0.0000000001	10,000,000,000
Area of Waste Disposal Unit	m^2	52,650	ft^2	4891	m^2	0.01	None
Length Scale of Facility	m	270	feet	82.3	m	0.000000001	10,000,000,000
Width Scale of Facility	m	195	feet	59.4	m	0.000000001	10,000,000,000
Recharge Rate into the Plume	m/yr	0	in/yr	0	m/yr	0	10,000,000,000
Duration of Pulse	yr	2,000	yr	2000	yr	0.000000001	None
Initial Concentration at Landfill	mg/L	5,040	mg/L	5,040	mg/L	0	None
Additional Parameters							
Method				Gaussian		Gaussian	Patch
Name of Chemical Specified				Chloride			

MODEL OUTPUT					
Concentration at Landfill	mg/L	4,404	mg/L		1000.0 yr

MODEL OUTPUT					
Concentration at Landfill		0	mg/L	Time	1.0 yr
		0	mg/L		1.5 yr
		0	mg/L		2.0 yr
		0	mg/L		2.5 yr
		13	mg/L		3.0 yr
		522	mg/L		5.0 yr
		1,507	mg/L		10.0 yr
		2,700	mg/L		20.0 yr
		3,098	mg/L		30.0 yr
		3,229	mg/L		40.0 yr
		3,360	mg/L		50.0 yr
		4,016	mg/L		100.0 yr
		4,349	mg/L		150.0 yr
		4,380	mg/L		200.0 yr
		4,397	mg/L		250.0 yr
		4,401	mg/L		300.0 yr
		4,403	mg/L		400.0 yr
		4,404	mg/L		500.0 yr
		4,404	mg/L		800.0 yr
		4,404	mg/L		1,000.0 yr

Chesapeake State L-2
Chesapeake Energy Corporation
Buckeye, Lea County, New Mexico

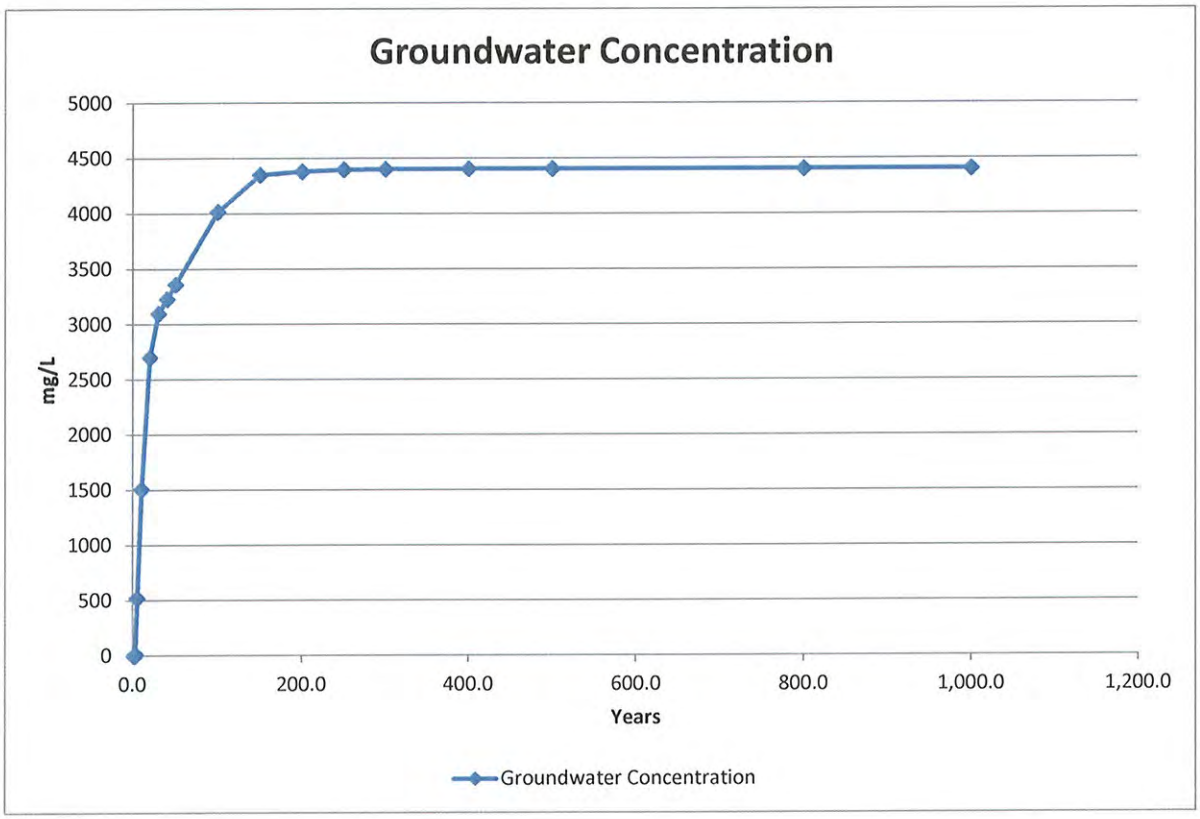


TABLE 6-2. DESCRIPTIVE STATISTICS FOR SATURATED HYDRAULIC CONDUCTIVITY (cm hr-1)

Soil Type	Hydraulic Conductivity (Ks)* x	s	CV	n
Clay**	0.2	0.42	210.3	114
Clay Loam	0.26	0.7	267.2	345
Loam	1.04	1.82	174.6	735
Loamy Sand	14.59	11.36	77.9	315
Silt	0.25	0.33	129.9	88
Silt Loam	0.45	1.23	275.1	1093
Silty Clay	0.02	0.11	453.3	126
Silty Clay Loam	0.07	0.19	288.7	592
Sand	29.7	15.6	52.4	246
Sandy Clay	0.12	0.28	234.1	46
Sandy Clay Loam	1.31	2.74	208.6	214
Sandy Loam	4.42	5.63	127	1183

* n = Sample size, = Mean, s = Standard deviation, CV = Coefficient of variation (percent)

** Agricultural soil, less than 60 percent clay

Sources: From Dean et al. (1989),
Original reference Carsel and Parrish (1988).

TABLE 6-3. TOTAL POROSITY OF VARIOUS MATERIALS

Material	No. of Analyses	Range	Arithmetic Mean
Igneous Rocks			
Weathered granite	8	0.34-0.57	0.45
Weathered gabbro	4	0.42-0.45	0.43
Basalt	94	0.03-0.35	0.17
Sedimentary Materials			
Sandstone	65	0.14-0.49	0.34
Siltstone	7	0.21-0.41	0.35
Sand (fine)	243	0.26-0.53	0.43
Sand (coarse)	26	0.31-0.46	0.39
Gravel (fine)	38	0.25-0.38	0.34
Gravel (coarse)	15	0.24-0.36	0.28
Silt	281	0.34-0.61	0.46
Clay	74	0.34-0.57	0.42
Limestone	74	0.07-0.56	0.3
Metamorphic Rocks			
Schist	18	0.04-0.49	0.38

Sources: From Mercer et al. (1982),
McWhorter and Sunada (1977),
Original reference Morris and Johnson, (1967).

Saturated water content is the maximum volumetric amount of water in the soil when all pores are filled with water. Very often it is assumed that saturated water content equals the porosity n . However, in many cases qS is smaller than n due to the fact that small amounts of air will be trapped in very small pores. Residual water content can be defined as the asymptote of the pF-curve when h gets very high negative values. Usually qR is very small - on the order of 0.001--0.02 for coarse soils but gets as high values as 0.15..0.25 for heavy clay soils. Air entry point ha is

Soil texture. Fine-textured soils can hold much more organic matter than sandy soils for two reasons. First, clay particles form electrochemical bonds that hold organic compounds. Second, decomposition occurs faster in well-aerated sandy soils. A sandy loam rarely holds more than 2% organic matter.

The recharge rate in this model is the net amount of water that percolates directly into the aquifer system outside of the land disposal facility. The recharge is assumed to have no contamination and hence dilutes the groundwater contaminant plume. The recharge rate into the plume can be calculated in a variety of ways. One possibility is to use a model, such as HELP (Hydrologic Evaluation of Landfill Performance) (Schroeder et al., 1984), without any engineering controls (leachate collection system or a liner) to simulate the water balance for natural conditions.

The infiltration rate is the net amount of leachate that percolates into the aquifer system from a land disposal facility. Because of the use of engineering controls and the presence of non-native porous materials in the landfill facility, the infiltration rate will typically be different than the recharge rate. However, it can be estimated by similar

Most soils contain 2-10 percent organic matter. *The Importance of Soil Organic Matter: Key to Drought-Resistant Soil and Sustained Food Production. http://www.fao.org*

APPENDIX B

NMOCD APPROVAL OF STAGE 2 ABATEMENT PLAN

From:	Chase Acker
To:	Bruce McKenzie
Subject:	FW: Stage 2 Abatement Plan Approval: AP-73 Former State L-2 Tank Battery located in Unit Letter C of Section 19 in Township 17 South, Range 36 East, NMPM in Lea County, NM
Date:	Monday, April 14, 2014 1:56:03 PM

From: Griswold, Jim, EMNRD [mailto:Jim.Griswold@state.nm.us]
Sent: Thursday, June 27, 2013 5:17 PM
To: Larry Wooten
Cc: sharon.hall@arcadis-us.com; Chase Acker
Subject: Stage 2 Abatement Plan Approval: AP-73 Former State L-2 Tank Battery located in Unit Letter C of Section 19 in Township 17 South, Range 36 East, NMPM in Lea County, NM

Mr. Wooten,

The Oil Conservation Division (OCD) has reviewed the Stage 2 Abatement Plan for the above-referenced site submitted on your behalf by Arcadis and dated 3/27/12. That plan has substantially met the requirements of 19.15.30 NMAC and is hereby approved. Please proceed with field activities.

Be advised this approval does not relieve Chesapeake of responsibility should the situation continue to pose a threat to groundwater, surface water, human health, or the environment. Furthermore, this approval does not relieve your responsibility for compliance with any federal, state, or local laws and/or regulations. Please retain a copy of this email for your files, as no hardcopy will be sent. If you have any questions, please feel free to contact me at any time.

Jim Griswold
Senior Hydrologist
EMNRD/Oil Conservation Division
1220 South St. Francis Drive
Santa Fe, New Mexico 87505
505.476.3465
email: jim.griswold@state.nm.us

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APPENDIX C

LABORATORY ANALYTICAL REPORTS AND CHAIN-OF-CUSTODY DOCUMENTATION

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
Tel: (615)726-0177

TestAmerica Job ID: 490-153283-1
TestAmerica Sample Delivery Group: Well Pad 890293
Client Project/Site: State L-2
Sampling Event: CHK State L-2

For:
Enviro Clean Services LLC
7060 S. Yale Avenue, Suite 603
Tulsa, Oklahoma 74136

Attn: Ms. Julie Czech

Cathy Gartner

Authorized for release by:
6/8/2018 1:40:03 PM

Cathy Gartner, Project Manager II
(615)301-5041
cathy.gartner@testamericainc.com

LINKS

Review your project results through TotalAccess

Have a Question? Ask The Expert

Visit us at: www.testamericainc.com

The test results in this report meet all 2003 NELAC and 2009 TNI requirements for accredited parameters, exceptions are noted in this report. This report may not be reproduced except in full, and with written approval from the laboratory. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

Sample Summary

Client: Enviro Clean Services LLC
Project/Site: State L-2

TestAmerica Job ID: 490-153283-1
SDG: Well Pad 890293

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
490-153283-1	MW-4	Water	06/05/18 10:20	06/06/18 09:25
490-153283-2	Dup	Water	06/05/18 00:01	06/06/18 09:25
490-153283-3	EQ Blank	Water	06/05/18 07:19	06/06/18 09:25
490-153283-4	Trip Blank	Water	06/05/18 00:01	06/06/18 09:25

Job ID: 490-153283-1

Laboratory: TestAmerica Nashville

Narrative

Job Narrative
490-153283-1

Comments
No additional comments.

Receipt
The samples were received on 6/6/2018 9:25 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 0.3º C.

GC/MS VOA
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

VOA Prep
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Client: Enviro Clean Services LLC
Project/Site: State L-2

TestAmerica Job ID: 490-153283-1
SDG: Well Pad 890293

Client Sample ID: MW-4
Date Collected: 06/05/18 10:20
Date Received: 06/06/18 09:25

Lab Sample ID: 490-153283-1
Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	1.02		0.500		ug/L			06/06/18 21:58	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*91*		*70 - 130*		*06/06/18 21:58*	*1*
4-Bromofluorobenzene (Surr)	*108*		*70 - 130*		*06/06/18 21:58*	*1*
Dibromofluoromethane (Surr)	*98*		*70 - 130*		*06/06/18 21:58*	*1*
Toluene-d8 (Surr)	*106*		*70 - 130*		*06/06/18 21:58*	*1*

Client Sample ID: Dup

Date Collected: 06/05/18 00:01
Date Received: 06/06/18 09:25

Lab Sample ID: 490-153283-2

Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	1.13		0.500		ug/L			06/06/18 21:05	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*89*		*70 - 130*		*06/06/18 21:05*	*1*
4-Bromofluorobenzene (Surr)	*107*		*70 - 130*		*06/06/18 21:05*	*1*
Dibromofluoromethane (Surr)	*98*		*70 - 130*		*06/06/18 21:05*	*1*
Toluene-d8 (Surr)	*102*		*70 - 130*		*06/06/18 21:05*	*1*

Client: Enviro Clean Services LLC
Project/Site: State L-2

TestAmerica Job ID: 490-153283-1
SDG: Well Pad 890293

Client Sample ID: EQ Blank
Date Collected: 06/05/18 07:19
Date Received: 06/06/18 09:25

Lab Sample ID: 490-153283-3
Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	ND		0.500		ug/L			06/06/18 19:46	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*96*		*70 - 130*		*06/06/18 19:46*	*1*
4-Bromofluorobenzene (Surr)	*106*		*70 - 130*		*06/06/18 19:46*	*1*
Dibromofluoromethane (Surr)	*99*		*70 - 130*		*06/06/18 19:46*	*1*
Toluene-d8 (Surr)	*106*		*70 - 130*		*06/06/18 19:46*	*1*

Client: Enviro Clean Services LLC
Project/Site: State L-2

TestAmerica Job ID: 490-153283-1
SDG: Well Pad 890293

Client Sample ID: Trip Blank

Date Collected: 06/05/18 00:01
Date Received: 06/06/18 09:25

Lab Sample ID: 490-153283-4

Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	ND		0.500		ug/L			06/06/18 18:26	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*92*		*70 - 130*		*06/06/18 18:26*	*1*
4-Bromofluorobenzene (Surr)	*107*		*70 - 130*		*06/06/18 18:26*	*1*
Dibromofluoromethane (Surr)	*100*		*70 - 130*		*06/06/18 18:26*	*1*
Toluene-d8 (Surr)	*105*		*70 - 130*		*06/06/18 18:26*	*1*

Method: 8260B - Volatile Organic Compounds (GC/MS)

Lab Sample ID: MB 490-519948/6
Matrix: Water
Analysis Batch: 519948

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	ND		0.500		ug/L			06/06/18 14:00	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*90*		*70 - 130*		*06/06/18 14:00*	*1*
4-Bromofluorobenzene (Surr)	*105*		*70 - 130*		*06/06/18 14:00*	*1*
Dibromofluoromethane (Surr)	*97*		*70 - 130*		*06/06/18 14:00*	*1*
Toluene-d8 (Surr)	*105*		*70 - 130*		*06/06/18 14:00*	*1*

Lab Sample ID: LCS 490-519948/4
Matrix: Water
Analysis Batch: 519948

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Benzene	20.0	20.39		ug/L		102	70 - 130
Ethylbenzene	20.0	20.26		ug/L		101	70 - 130
Toluene	20.0	21.30		ug/L		107	70 - 130
Xylenes, Total	40.0	40.48		ug/L		101	70 - 132

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*93*		*70 - 130*
4-Bromofluorobenzene (Surr)	*105*		*70 - 130*
Dibromofluoromethane (Surr)	*97*		*70 - 130*
Toluene-d8 (Surr)	*104*		*70 - 130*

Lab Sample ID: 490-153255-B-1 MS
Matrix: Water
Analysis Batch: 519948

Client Sample ID: Matrix Spike
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Benzene	ND		20.0	23.20		ug/L		116	55 - 147
Ethylbenzene	ND		20.0	22.70		ug/L		114	65 - 139
Toluene	ND		20.0	24.22		ug/L		121	64 - 136
Xylenes, Total	ND		40.0	44.47		ug/L		111	69 - 132

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*91*		*70 - 130*
4-Bromofluorobenzene (Surr)	*108*		*70 - 130*
Dibromofluoromethane (Surr)	*100*		*70 - 130*
Toluene-d8 (Surr)	*105*		*70 - 130*

Lab Sample ID: 490-153255-C-1 MSD
Matrix: Water
Analysis Batch: 519948

Client Sample ID: Matrix Spike Duplicate
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Benzene	ND		20.0	23.03		ug/L		115	55 - 147	1	22
Ethylbenzene	ND		20.0	22.25		ug/L		111	65 - 139	2	18

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: 490-153255-C-1 MSD
Matrix: Water
Analysis Batch: 519948

Client Sample ID: Matrix Spike Duplicate
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Toluene	ND		20.0	24.62		ug/L		123	64 - 136	2	18
Xylenes, Total	ND		40.0	44.06		ug/L		110	69 - 132	1	17

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*89*		*70 - 130*
4-Bromofluorobenzene (Surr)	*106*		*70 - 130*
Dibromofluoromethane (Surr)	*97*		*70 - 130*
Toluene-d8 (Surr)	*104*		*70 - 130*

QC Association Summary

Client: Enviro Clean Services LLC
Project/Site: State L-2

TestAmerica Job ID: 490-153283-1
SDG: Well Pad 890293

GC/MS VOA

Analysis Batch: 519948

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-153283-1	MW-4	Total/NA	Water	8260B	
490-153283-2	Dup	Total/NA	Water	8260B	
490-153283-3	EQ Blank	Total/NA	Water	8260B	
490-153283-4	Trip Blank	Total/NA	Water	8260B	
MB 490-519948/6	Method Blank	Total/NA	Water	8260B	
LCS 490-519948/4	Lab Control Sample	Total/NA	Water	8260B	
490-153255-B-1 MS	Matrix Spike	Total/NA	Water	8260B	
490-153255-C-1 MSD	Matrix Spike Duplicate	Total/NA	Water	8260B	

Lab Chronicle

Client: Enviro Clean Services LLC
Project/Site: State L-2

TestAmerica Job ID: 490-153283-1
SDG: Well Pad 890293

Client Sample ID: MW-4
Date Collected: 06/05/18 10:20
Date Received: 06/06/18 09:25

Lab Sample ID: 490-153283-1
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	5 mL	5 mL	519948	06/06/18 21:58	S1S	TAL NSH

Client Sample ID: Dup
Date Collected: 06/05/18 00:01
Date Received: 06/06/18 09:25

Lab Sample ID: 490-153283-2
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	5 mL	5 mL	519948	06/06/18 21:05	S1S	TAL NSH

Client Sample ID: EQ Blank
Date Collected: 06/05/18 07:19
Date Received: 06/06/18 09:25

Lab Sample ID: 490-153283-3
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	5 mL	5 mL	519948	06/06/18 19:46	S1S	TAL NSH

Client Sample ID: Trip Blank
Date Collected: 06/05/18 00:01
Date Received: 06/06/18 09:25

Lab Sample ID: 490-153283-4
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	5 mL	5 mL	519948	06/06/18 18:26	S1S	TAL NSH

Laboratory References:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

Method Summary

Client: Enviro Clean Services LLC
Project/Site: State L-2

TestAmerica Job ID: 490-153283-1
SDG: Well Pad 890293

Method	Method Description	Protocol	Laboratory
8260B	Volatile Organic Compounds (GC/MS)	SW846	TAL NSH
5030B	Purge and Trap	SW846	TAL NSH

Protocol References:

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

Accreditation/Certification Summary

Client: Enviro Clean Services LLC
Project/Site: State L-2

TestAmerica Job ID: 490-153283-1
SDG: Well Pad 890293

Laboratory: TestAmerica Nashville

The accreditations/certifications listed below are applicable to this report.

Authority	Program	EPA Region	Identification Number	Expiration Date
Oklahoma	State Program	6	9412	08-31-18

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
Nashville, TN

COOLER RECEIPT FORM

490-153283 Chain of Custody

Cooler Received/Opened On 6/6/2018 @ 0925

Time Samples Removed From Cooler 1530 Time Samples Placed In Storage 1616 (2 Hour Window)

1. Tracking # 6999 (last 4 digits, FedEx) Courier: FedEx

IR Gun ID 17960353 pH Strip Lot N/A Chlorine Strip Lot N/A

2. Temperature of rep. sample or temp blank when opened: 0-3 Degrees Celsius

3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES NO...NA

4. Were custody seals on outside of cooler? YES...NO...NA

If yes, how many and where: 1 Front

5. Were the seals intact, signed, and dated correctly? YES...NO...NA

6. Were custody papers inside cooler? YES...NO...NA

I certify that I opened the cooler and answered questions 1-6 (intial) AM

7. Were custody seals on containers: YES NO and Intact YES...NO...NA

Were these signed and dated correctly? YES...NO...NA

8. Packing mat'l used? Bubblewrap Plastic bag Peanuts Vermiculite Foam Insert Paper Other None

9. Cooling process: Ice Ice-pack Ice (direct contact) Dry ice Other None

10. Did all containers arrive in good condition (unbroken)? YES...NO...NA

11. Were all container labels complete (#, date, signed, pres., etc)? YES...NO...NA

12. Did all container labels and tags agree with custody papers? YES...NO...NA

13a. Were VOA vials received? YES...NO...NA

b. Was there any observable headspace present in any VOA vial? YES...NO...NA

Larger than this.

6-6-18

14. Was there a Trip Blank in this cooler? YES...NO...NA If multiple coolers, sequence #_____

I certify that I unloaded the cooler and answered questions 7-14 (intial) _____

15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? YES...NO...NA

b. Did the bottle labels indicate that the correct preservatives were used YES...NO...NA

16. Was residual chlorine present? YES...NO...NA

I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial) _____

17. Were custody papers properly filled out (ink, signed, etc)? YES...NO...NA

18. Did you sign the custody papers in the appropriate place? YES...NO...NA

19. Were correct containers used for the analysis requested? YES...NO...NA

20. Was sufficient amount of sample sent in each container? YES...NO...NA

I certify that I entered this project into LIMS and answered questions 17-20 (intial) _____

I certify that I attached a label with the unique LIMS number to each container (intial) _____

21. Were there Non-Conformance issues at login? YES...NO Was a NCM generated? YES...NO...#_____

BIS = Broken in shipment
Cooler Receipt Form.doc

LF-1
End of Form

Revised 8/23/17

CHAIN OF CUSTODY RECORD

No. 04300

ENVIRO CLEAN SERVICES, LLC
(918) 794-7828

PROJECT NUMBER: CHKHSTL201	PROJECT NAME: CHK STATE L	COC 1 of 1	
SHIPPED TO: TA-NASHVILLE	PROJECT MANAGER: BRUCE MCKENZIE	TAT: STANDARD	

SAMPLER'S PRINTED NAME: Terry Fisher
SAMPLER'S SIGNATURE:

Date	Time	Sample ID	Sample Matrix	# of Sample Containers	~~CHLORIDES~~	BENZENE	REMARKS
6-5-18	1020	MW-4	W	3		X	
6-5-18	—	Dup	W	3		X	
6-5-18	0719	EQ Blank	W	3		X	
—	—	Trip	W	2		X	
—	—	Temp	W	1			

Loc: 490
153283

TOTAL NUMBER OF CONTAINERS → 12

RELINQUISHED BY:	DATE 6-5-18	RECEIVED BY:	DATE
	TIME 1600		TIME
RELINQUISHED BY:	DATE	RECEIVED BY:	DATE 6-6-18
	TIME		TIME 0425

METHOD OF SHIPMENT: FEDEX
AIRBILL NUMBER: 4358 5281 6999

RECEIVED IN LABORATORY BY: DATE / TIME

Send PDF, EDD, and INVOICE (if applicable) to:
JULIE CZECH at julie.czech@eccgrp.com

LABORATORY CONTACT: 615-301-5041
LABORATORY ADDRESS: 2960 Foster Creighton Drive Nashville, TN 37204

POINT OF ORIGIN: ☐ OKLAHOMA CITY ☒ TULSA ☐ NORMAN ☐ WOODWARD ☐ ARLINGTON ☐ MIDLAND ☐ OTHER:

PAGE #1 - RECEIVING LAB | PAGE #2 - ENVIRO CLEAN PROJECT FILE | PAGE #3 - ENVIRO CLEAN QA/QC DEPT

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
Tel: (615)726-0177

TestAmerica Job ID: 490-158785-1
TestAmerica Sample Delivery Group: Well Pad 890293
Client Project/Site: State L-2
Sampling Event: CHK State L-2

For:
Enviro Clean Services LLC
7060 S. Yale Avenue, Suite 603
Tulsa, Oklahoma 74136

Attn: Ms. Julie Czech

Cathy Gartner

Authorized for release by:
9/14/2018 6:47:16 PM

Cathy Gartner, Project Manager II
(615)301-5041
cathy.gartner@testamericainc.com

LINKS

Review your project results through TotalAccess

Have a Question? Ask The Expert

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The test results in this report meet all 2003 NELAC and 2009 TNI requirements for accredited parameters, exceptions are noted in this report. This report may not be reproduced except in full, and with written approval from the laboratory. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

Sample Summary

Client: Enviro Clean Services LLC
Project/Site: State L-2

TestAmerica Job ID: 490-158785-1
SDG: Well Pad 890293

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
490-158785-1	EQ Blank	Water	09/05/18 07:50	09/07/18 09:50
490-158785-2	MW-4	Water	09/05/18 10:57	09/07/18 09:50
490-158785-3	Dup	Water	09/05/18 01:01	09/07/18 09:50

Job ID: 490-158785-1

Laboratory: TestAmerica Nashville

Narrative

Job Narrative
490-158785-1

Comments
No additional comments.

Receipt
The samples were received on 9/7/2018 9:50 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 3.4° C.

GC/MS VOA
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

VOA Prep
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Client: Enviro Clean Services LLC
Project/Site: State L-2

TestAmerica Job ID: 490-158785-1
SDG: Well Pad 890293

Client Sample ID: EQ Blank
Date Collected: 09/05/18 07:50
Date Received: 09/07/18 09:50

Lab Sample ID: 490-158785-1
Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	ND		0.500		ug/L			09/08/18 18:10	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*98*		*70 - 130*		*09/08/18 18:10*	*1*
4-Bromofluorobenzene (Surr)	*112*		*70 - 130*		*09/08/18 18:10*	*1*
Dibromofluoromethane (Surr)	*91*		*70 - 130*		*09/08/18 18:10*	*1*
Toluene-d8 (Surr)	*100*		*70 - 130*		*09/08/18 18:10*	*1*

Client: Enviro Clean Services LLC
Project/Site: State L-2

TestAmerica Job ID: 490-158785-1
SDG: Well Pad 890293

Client Sample ID: MW-4
Date Collected: 09/05/18 10:57
Date Received: 09/07/18 09:50

Lab Sample ID: 490-158785-2
Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	ND		0.500		ug/L			09/08/18 19:58	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*99*		*70 - 130*		*09/08/18 19:58*	*1*
4-Bromofluorobenzene (Surr)	*111*		*70 - 130*		*09/08/18 19:58*	*1*
Dibromofluoromethane (Surr)	*91*		*70 - 130*		*09/08/18 19:58*	*1*
Toluene-d8 (Surr)	*100*		*70 - 130*		*09/08/18 19:58*	*1*

Client: Enviro Clean Services LLC
Project/Site: State L-2

TestAmerica Job ID: 490-158785-1
SDG: Well Pad 890293

Client Sample ID: Dup
Date Collected: 09/05/18 01:01
Date Received: 09/07/18 09:50

Lab Sample ID: 490-158785-3
Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	ND		0.500		ug/L			09/08/18 20:24	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*96*		*70 - 130*		*09/08/18 20:24*	*1*
4-Bromofluorobenzene (Surr)	*108*		*70 - 130*		*09/08/18 20:24*	*1*
Dibromofluoromethane (Surr)	*89*		*70 - 130*		*09/08/18 20:24*	*1*
Toluene-d8 (Surr)	*91*		*70 - 130*		*09/08/18 20:24*	*1*

Method: 8260B - Volatile Organic Compounds (GC/MS)

Lab Sample ID: MB 490-541486/6
Matrix: Water
Analysis Batch: 541486

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	ND		0.500		ug/L			09/08/18 17:16	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*102*		*70 - 130*		*09/08/18 17:16*	*1*
4-Bromofluorobenzene (Surr)	*117*		*70 - 130*		*09/08/18 17:16*	*1*
Dibromofluoromethane (Surr)	*95*		*70 - 130*		*09/08/18 17:16*	*1*
Toluene-d8 (Surr)	*97*		*70 - 130*		*09/08/18 17:16*	*1*

Lab Sample ID: LCS 490-541486/3
Matrix: Water
Analysis Batch: 541486

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Benzene			20.0	20.45		ug/L		102	70 - 130		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*96*		*70 - 130*
4-Bromofluorobenzene (Surr)	*107*		*70 - 130*
Dibromofluoromethane (Surr)	*94*		*70 - 130*
Toluene-d8 (Surr)	*99*		*70 - 130*

Lab Sample ID: 490-158785-2 MS
Matrix: Water
Analysis Batch: 541486

Client Sample ID: MW-4
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits		
Benzene	ND		20.0	21.32		ug/L		107	55 - 147		

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*100*		*70 - 130*
4-Bromofluorobenzene (Surr)	*109*		*70 - 130*
Dibromofluoromethane (Surr)	*94*		*70 - 130*
Toluene-d8 (Surr)	*81*		*70 - 130*

Lab Sample ID: 490-158785-2 MSD
Matrix: Water
Analysis Batch: 541486

Client Sample ID: MW-4
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Benzene	ND		20.0	23.18		ug/L		116	55 - 147	8	22

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*101*		*70 - 130*
4-Bromofluorobenzene (Surr)	*116*		*70 - 130*
Dibromofluoromethane (Surr)	*90*		*70 - 130*
Toluene-d8 (Surr)	*91*		*70 - 130*

QC Association Summary

Client: Enviro Clean Services LLC
Project/Site: State L-2

TestAmerica Job ID: 490-158785-1
SDG: Well Pad 890293

GC/MS VOA

Analysis Batch: 541486

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-158785-1	EQ Blank	Total/NA	Water	8260B	
490-158785-2	MW-4	Total/NA	Water	8260B	
490-158785-3	Dup	Total/NA	Water	8260B	
MB 490-541486/6	Method Blank	Total/NA	Water	8260B	
LCS 490-541486/3	Lab Control Sample	Total/NA	Water	8260B	
490-158785-2 MS	MW-4	Total/NA	Water	8260B	
490-158785-2 MSD	MW-4	Total/NA	Water	8260B	

Lab Chronicle

Client: Enviro Clean Services LLC
Project/Site: State L-2

TestAmerica Job ID: 490-158785-1
SDG: Well Pad 890293

Client Sample ID: EQ Blank
Date Collected: 09/05/18 07:50
Date Received: 09/07/18 09:50

Lab Sample ID: 490-158785-1
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	5 mL	5 mL	541486	09/08/18 18:10	P1B	TAL NSH

Client Sample ID: MW-4
Date Collected: 09/05/18 10:57
Date Received: 09/07/18 09:50

Lab Sample ID: 490-158785-2
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	5 mL	5 mL	541486	09/08/18 19:58	P1B	TAL NSH

Client Sample ID: Dup
Date Collected: 09/05/18 01:01
Date Received: 09/07/18 09:50

Lab Sample ID: 490-158785-3
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	5 mL	5 mL	541486	09/08/18 20:24	P1B	TAL NSH

Laboratory References:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

Method Summary

Client: Enviro Clean Services LLC
Project/Site: State L-2

TestAmerica Job ID: 490-158785-1
SDG: Well Pad 890293

Method	Method Description	Protocol	Laboratory
8260B	Volatile Organic Compounds (GC/MS)	SW846	TAL NSH
5030B	Purge and Trap	SW846	TAL NSH

Protocol References:

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

Accreditation/Certification Summary

Client: Enviro Clean Services LLC
Project/Site: State L-2

TestAmerica Job ID: 490-158785-1
SDG: Well Pad 890293

Laboratory: TestAmerica Nashville

The accreditations/certifications listed below are applicable to this report.

Authority	Program	EPA Region	Identification Number	Expiration Date
Oklahoma	State Program	6	9412	08-31-19

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
Nashville, TN

COOLER RECEIPT FORM

490-158785 Chain of Custody

Cooler Received/Opened On 9/7/2018 @ 9:50

Time Samples Removed From Cooler 1614 Time Samples Placed In Storage 1625 (2 Hour Window)

1. Tracking # 4895 (last 4 digits, FedEx) Courier: FedEx

IR Gun ID 17960358 pH Strip Lot NA Chlorine Strip Lot NA

2. Temperature of rep. sample or temp blank when opened: 3.4 *Degrees Celsius*

3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES NO...NA

4. Were custody seals on outside of cooler? YES...NO...NA

If yes, how many and where: 1 Front

5. Were the seals intact, signed, and dated correctly? YES...NO...NA

6. Were custody papers inside cooler? YES...NO...NA

I certify that I opened the cooler and answered questions 1-6 (intial) _____

7. Were custody seals on containers: YES NO and Intact YES...NO...NA

Were these signed and dated correctly? YES...NO...NA

8. Packing mat'l used? Bubblewrap Plastic bag Peanuts Vermiculite Foam Insert Paper Other None

9. Cooling process: Ice Ice-pack Ice (direct contact) Dry ice Other None

10. Did all containers arrive in good condition (unbroken)? YES...NO...NA

11. Were all container labels complete (#, date, signed, pres., etc)? YES...NO...NA

12. Did all container labels and tags agree with custody papers? YES...NO...NA

13a. Were VOA vials received? YES...NO...NA

b. Was there any observable headspace present in any VOA vial? YES...NO...NA

Larger than this.

14. Was there a Trip Blank in this cooler? YES...NO...NA If multiple coolers, sequence # _____

I certify that I unloaded the cooler and answered questions 7-14 (intial) GH

15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? YES...NO...NA

b. Did the bottle labels indicate that the correct preservatives were used YES...NO...NA

16. Was residual chlorine present? YES...NO...NA

I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial) GH

17. Were custody papers properly filled out (ink, signed, etc)? YES...NO...NA

18. Did you sign the custody papers in the appropriate place? YES...NO...NA

19. Were correct containers used for the analysis requested? YES...NO...NA

20. Was sufficient amount of sample sent in each container? YES...NO...NA

I certify that I entered this project into LIMS and answered questions 17-20 (intial) GH

I certify that I attached a label with the unique LIMS number to each container (intial) GH

21. Were there Non-Conformance issues at login? YES...NO Was a NCM generated? YES...NO...#_____

BIS = Broken in shipment
Cooler Receipt Form.doc

LF-1
End of Form

Revised 8/23/17

CHAIN OF CUSTODY RECORD

No. 04390

ENVIRO CLEAN SERVICES, LLC
(918) 794-7828

PROJECT NUMBER: CHKHSTL201	PROJECT NAME: CHK STATE L	COC 1 of 1	
SHIPPED TO: TA-NASH	PROJECT MANAGER: DAVID BRADY	TAT: STANDARD	

SAMPLER'S PRINTED NAME: TERRY FISHER
SAMPLER'S SIGNATURE:

Date	Time	Sample ID	Sample Matrix	# of Sample Containers	BENZENE	REMARKS
9-5-18	750	EQ Blank	WT	3	X	
9-5-18	1057	MW-4	WT	3	X	Loc: 490 158785
9-5-18	—	DUP	WT	3	X	
—	—	TRIP BLANK	WT	2		

TOTAL NUMBER OF CONTAINERS → 11

RELINQUISHED BY:	DATE 9-6-18	RECEIVED BY: TA-NAS 3.4°C	DATE 9-7-18
	TIME 1600		TIME 0950
RELINQUISHED BY:	DATE	RECEIVED BY: ~~4445 6530 4895~~	DATE
	TIME		TIME
METHOD OF SHIPMENT: FEDEX		AIRBILL NUMBER: ~~4445~~ 4445 6530 4895	
RECEIVED IN LABORATORY BY:	DATE	Send PDF, EDD, and INVOICE (if applicable) to: JULIE CZECH at julie.czech@eccgrp.com	
	TIME		
LABORATORY CONTACT: 615-301-5041		LABORATORY ADDRESS: 2960 Foster Creighton Drive Nashville, TN 37204	

POINT OF ORIGIN: ☐ OKLAHOMA CITY ☒ TULSA ☐ NORMAN ☐ WOODWARD ☐ ARLINGTON ☐ MIDLAND ☐ OTHER:

PAGE #1 - RECEIVING LAB PAGE #2 - ENVIRO CLEAN PROJECT FILE PAGE #3 - ENVIRO CLEAN QA/QC DEPT

9/14/2018

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
Tel: (615)726-0177

TestAmerica Job ID: 490-165005-1
TestAmerica Sample Delivery Group: Property ID: 890293
Client Project/Site: State L
Sampling Event: State L

For:
Chesapeake Energy Corporation
PO BOX 548806
Oklahoma City, Oklahoma 73154

Attn: Chase Acker

Cathy Gartner

Authorized for release by:
12/19/2018 3:36:44 PM

Cathy Gartner, Project Manager II
(615)301-5041
cathy.gartner@testamericainc.com

LINKS

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Have a Question? Ask The Expert

Visit us at: www.testamericainc.com

The test results in this report meet all 2003 NELAC and 2009 TNI requirements for accredited parameters, exceptions are noted in this report. This report may not be reproduced except in full, and with written approval from the laboratory. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

Sample Summary

Client: Chesapeake Energy Corporation
Project/Site: State L

TestAmerica Job ID: 490-165005-1
SDG: Property ID: 890293

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
490-165005-1	MW-4	Water	12/11/18 10:30	12/14/18 10:00
490-165005-2	Dup	Water	12/11/18 00:01	12/14/18 10:00
490-165005-3	Trip Blank	Water	12/11/18 00:01	12/14/18 10:00

Job ID: 490-165005-1

Laboratory: TestAmerica Nashville

Narrative

Job Narrative
490-165005-1

Comments
No additional comments.

Receipt
The samples were received on 12/14/2018 10:00 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 1.1° C.

GC/MS VOA
Method(s) 8260B: Insufficient sample volume was available to perform a matrix spike/matrix spike duplicate/sample duplicate (MS/MSD/DUP) associated with analytical batch 490-564018.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

VOA Prep
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Client: Chesapeake Energy Corporation
Project/Site: State L

TestAmerica Job ID: 490-165005-1
SDG: Property ID: 890293

Client Sample ID: MW-4
Date Collected: 12/11/18 10:30
Date Received: 12/14/18 10:00

Lab Sample ID: 490-165005-1
Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	ND		0.500		ug/L			12/15/18 19:59	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*114*		*70 - 130*		*12/15/18 19:59*	*1*
4-Bromofluorobenzene (Surr)	*106*		*70 - 130*		*12/15/18 19:59*	*1*
Dibromofluoromethane (Surr)	*104*		*70 - 130*		*12/15/18 19:59*	*1*
Toluene-d8 (Surr)	*101*		*70 - 130*		*12/15/18 19:59*	*1*

Client: Chesapeake Energy Corporation
Project/Site: State L

TestAmerica Job ID: 490-165005-1
SDG: Property ID: 890293

Client Sample ID: Dup
Date Collected: 12/11/18 00:01
Date Received: 12/14/18 10:00

Lab Sample ID: 490-165005-2
Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	ND		0.500		ug/L			12/15/18 20:25	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*111*		*70 - 130*		*12/15/18 20:25*	*1*
4-Bromofluorobenzene (Surr)	*112*		*70 - 130*		*12/15/18 20:25*	*1*
Dibromofluoromethane (Surr)	*104*		*70 - 130*		*12/15/18 20:25*	*1*
Toluene-d8 (Surr)	*101*		*70 - 130*		*12/15/18 20:25*	*1*

Client: Chesapeake Energy Corporation
Project/Site: State L

TestAmerica Job ID: 490-165005-1
SDG: Property ID: 890293

Client Sample ID: Trip Blank
Date Collected: 12/11/18 00:01
Date Received: 12/14/18 10:00

Lab Sample ID: 490-165005-3
Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	ND		0.500		ug/L			12/15/18 17:23	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*111*		*70 - 130*		*12/15/18 17:23*	*1*
4-Bromofluorobenzene (Surr)	*114*		*70 - 130*		*12/15/18 17:23*	*1*
Dibromofluoromethane (Surr)	*103*		*70 - 130*		*12/15/18 17:23*	*1*
Toluene-d8 (Surr)	*103*		*70 - 130*		*12/15/18 17:23*	*1*

Method: 8260B - Volatile Organic Compounds (GC/MS)

Lab Sample ID: MB 490-564018/7
Matrix: Water
Analysis Batch: 564018

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	ND		0.500		ug/L			12/15/18 16:31	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*117*		*70 - 130*		*12/15/18 16:31*	*1*
4-Bromofluorobenzene (Surr)	*109*		*70 - 130*		*12/15/18 16:31*	*1*
Dibromofluoromethane (Surr)	*103*		*70 - 130*		*12/15/18 16:31*	*1*
Toluene-d8 (Surr)	*103*		*70 - 130*		*12/15/18 16:31*	*1*

Lab Sample ID: LCS 490-564018/3
Matrix: Water
Analysis Batch: 564018

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Benzene			50.0	54.10		ug/L		108	70 - 130		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*108*		*70 - 130*
4-Bromofluorobenzene (Surr)	*113*		*70 - 130*
Dibromofluoromethane (Surr)	*102*		*70 - 130*
Toluene-d8 (Surr)	*99*		*70 - 130*

Lab Sample ID: LCSD 490-564018/4
Matrix: Water
Analysis Batch: 564018

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Benzene			50.0	53.98		ug/L		108	70 - 130	0	12

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*108*		*70 - 130*
4-Bromofluorobenzene (Surr)	*114*		*70 - 130*
Dibromofluoromethane (Surr)	*100*		*70 - 130*
Toluene-d8 (Surr)	*103*		*70 - 130*

QC Association Summary

Client: Chesapeake Energy Corporation
Project/Site: State L

TestAmerica Job ID: 490-165005-1
SDG: Property ID: 890293

GC/MS VOA

Analysis Batch: 564018

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-165005-1	MW-4	Total/NA	Water	8260B	
490-165005-2	Dup	Total/NA	Water	8260B	
490-165005-3	Trip Blank	Total/NA	Water	8260B	
MB 490-564018/7	Method Blank	Total/NA	Water	8260B	
LCS 490-564018/3	Lab Control Sample	Total/NA	Water	8260B	
LCSD 490-564018/4	Lab Control Sample Dup	Total/NA	Water	8260B	

Lab Chronicle

Client: Chesapeake Energy Corporation
Project/Site: State L

TestAmerica Job ID: 490-165005-1
SDG: Property ID: 890293

Client Sample ID: MW-4

Lab Sample ID: 490-165005-1

Date Collected: 12/11/18 10:30

Matrix: Water

Date Received: 12/14/18 10:00

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	10 mL	10 mL	564018	12/15/18 19:59	AK1	TAL NSH

Client Sample ID: Dup

Lab Sample ID: 490-165005-2

Date Collected: 12/11/18 00:01

Matrix: Water

Date Received: 12/14/18 10:00

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	10 mL	10 mL	564018	12/15/18 20:25	AK1	TAL NSH

Client Sample ID: Trip Blank

Lab Sample ID: 490-165005-3

Date Collected: 12/11/18 00:01

Matrix: Water

Date Received: 12/14/18 10:00

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	10 mL	10 mL	564018	12/15/18 17:23	AK1	TAL NSH

Laboratory References:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

Method Summary

Client: Chesapeake Energy Corporation
Project/Site: State L

TestAmerica Job ID: 490-165005-1
SDG: Property ID: 890293

Method	Method Description	Protocol	Laboratory
8260B	Volatile Organic Compounds (GC/MS)	SW846	TAL NSH
5030B	Purge and Trap	SW846	TAL NSH

Protocol References:

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

Accreditation/Certification Summary

Client: Chesapeake Energy Corporation
Project/Site: State L

TestAmerica Job ID: 490-165005-1
SDG: Property ID: 890293

Laboratory: TestAmerica Nashville

The accreditations/certifications listed below are applicable to this report.

Authority	Program	EPA Region	Identification Number	Expiration Date
Oklahoma	State Program	6	9412	08-31-19

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
Nashville, TN

COOLER RECEIPT FORM

490-165005 Chain of Custody

Cooler Received/Opened On 12/14/2018 @ 1000

Time Samples Removed From Cooler 1710 Time Samples Placed In Storage 1748 (2 Hour Window)

1. Tracking # 7064 (last 4 digits, FedEx) Courier: FedEx

IR Gun ID 17610176 pH Strip Lot N/A Chlorine Strip Lot N/A

2. Temperature of rep. sample or temp blank when opened: 1.1 *Degrees Celsius*

3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES NO NA

4. Were custody seals on outside of cooler? YES...NO...NA

If yes, how many and where: 1 (Front) 1 (Back)

5. Were the seals intact, signed, and dated correctly? YES...NO...NA

6. Were custody papers inside cooler? YES...NO...NA

I certify that I opened the cooler and answered questions 1-6 (intial) 2-2

7. Were custody seals on containers: YES NO and Intact YES...NO...NA

Were these signed and dated correctly? YES...NO...NA

8. Packing mat'l used? Bubblewrap Plastic bag Peanuts Vermiculite Foam Insert Paper Other None

9. Cooling process: Ice Ice-pack Ice (direct contact) Dry ice Other None

10. Did all containers arrive in good condition (unbroken)? YES...NO...NA

11. Were all container labels complete (#, date, signed, pres., etc)? YES...NO...NA

12. Did all container labels and tags agree with custody papers? YES...NO...NA

13a. Were VOA vials received? YES...NO...NA

b. Was there any observable headspace present in any VOA vial? YES...NO...NA

Larger than this.

14. Was there a Trip Blank in this cooler? YES...NO...NA If multiple coolers, sequence #_____

I certify that I unloaded the cooler and answered questions 7-14 (intial)

15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? YES...NO...NA

b. Did the bottle labels indicate that the correct preservatives were used YES...NO...NA

16. Was residual chlorine present? YES...NO...NA

I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial)

17. Were custody papers properly filled out (ink, signed, etc)? YES...NO...NA

18. Did you sign the custody papers in the appropriate place? YES...NO...NA

19. Were correct containers used for the analysis requested? YES...NO...NA

20. Was sufficient amount of sample sent in each container? YES...NO...NA

I certify that I entered this project into LIMS and answered questions 17-20 (intial)

I certify that I attached a label with the unique LIMS number to each container (intial)

21. Were there Non-Conformance issues at login? YES...NO Was a NCM generated? YES...NO...#_____

BIS = Broken in shipment

CHAIN OF CUSTODY RECORD

No. 1026

EQUUS environmental solutions

PROJECT NUMBER: CHKSTAL: H18001	PROJECT NAME: CHK STATE L	COC 1 of 2	
SHIPPED TO: TA-NASHVILLE	PROJECT MANAGER: DAVID BRADY	TAT: STANDARD	

SAMPLER'S PRINTED NAME:

SAMPLER'S SIGNATURE:

ASOW: N/A

Date	Time	Sample ID	Sample Matrix	# of Sample Containers	BENZENE	REMARKS
12-11-18	1030	MW-4	water	3	X	
12-11-18	—	Dup	water	3	X	Loc: 490 165005
—	—	Trip	water	2	X	

TOTAL NUMBER OF CONTAINERS → 8

RELINQUISHED BY:	DATE 12-13-18	RECEIVED BY:	DATE
	TIME 1600		TIME
RELINQUISHED BY:	DATE	RECEIVED BY:	DATE
	TIME		TIME

METHOD OF SHIPMENT: FEDEX

AIRBILL NUMBER: 4445 6535 7064

RECEIVED IN LABORATORY BY: DATE 12/14/18 TIME 10:00

Send PDF, EDD, and INVOICE (if applicable) to: JULIE.CZECH@EQUUSENV.COM

LABORATORY CONTACT: 615-301-5041

LABORATORY ADDRESS: 2960 FOSTER CREIGHTON DRIVE NASHVILLE, TN 37204

POINT OF ORIGIN:

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
Tel: (615)726-0177

TestAmerica Job ID: 490-169840-1
TestAmerica Sample Delivery Group: Property ID: 890293
Client Project/Site: State L-2

For:
Chesapeake Energy Corporation
PO BOX 548806
Oklahoma City, Oklahoma 73154

Attn: Chase Acker

Cathy Gartner

Authorized for release by:
3/14/2019 5:35:10 PM

Cathy Gartner, Project Manager II
(615)301-5041
cathy.gartner@testamericainc.com

Links

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This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

Sample Summary

Client: Chesapeake Energy Corporation
Project/Site: State L-2

TestAmerica Job ID: 490-169840-1
SDG: Property ID: 890293

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
490-169840-1	EQ Blank	Water	03/06/19 07:50	03/08/19 09:00
490-169840-2	MW-4	Water	03/06/19 10:00	03/08/19 09:00
490-169840-3	Dup	Water	03/06/19 00:01	03/08/19 09:00
490-169840-4	Trip Blank	Water	03/06/19 00:01	03/08/19 09:00

Job ID: 490-169840-1

Laboratory: TestAmerica Nashville

Narrative

Job Narrative
490-169840-1

Comments
No additional comments.

Receipt
The samples were received on 3/8/2019 9:00 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 4.1° C.

GC/MS VOA
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

VOA Prep
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Client Sample ID: EQ Blank

Date Collected: 03/06/19 07:50
Date Received: 03/08/19 09:00

Lab Sample ID: 490-169840-1

Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	ND		0.500		ug/L			03/09/19 06:14	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*92*		*70 - 130*		*03/09/19 06:14*	*1*
4-Bromofluorobenzene (Surr)	*86*		*70 - 130*		*03/09/19 06:14*	*1*
Dibromofluoromethane (Surr)	*101*		*70 - 130*		*03/09/19 06:14*	*1*
Toluene-d8 (Surr)	*114*		*70 - 130*		*03/09/19 06:14*	*1*

Client Sample ID: MW-4

Date Collected: 03/06/19 10:00
Date Received: 03/08/19 09:00

Lab Sample ID: 490-169840-2

Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	1.69		0.500		ug/L			03/09/19 07:34	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*97*		*70 - 130*		*03/09/19 07:34*	*1*
4-Bromofluorobenzene (Surr)	*90*		*70 - 130*		*03/09/19 07:34*	*1*
Dibromofluoromethane (Surr)	*108*		*70 - 130*		*03/09/19 07:34*	*1*
Toluene-d8 (Surr)	*113*		*70 - 130*		*03/09/19 07:34*	*1*

Client Sample ID: Dup

Date Collected: 03/06/19 00:01
Date Received: 03/08/19 09:00

Lab Sample ID: 490-169840-3

Matrix: Water

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	1.69		0.500		ug/L			03/09/19 08:00	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*94*		*70 - 130*		*03/09/19 08:00*	*1*
4-Bromofluorobenzene (Surr)	*83*		*70 - 130*		*03/09/19 08:00*	*1*
Dibromofluoromethane (Surr)	*108*		*70 - 130*		*03/09/19 08:00*	*1*
Toluene-d8 (Surr)	*111*		*70 - 130*		*03/09/19 08:00*	*1*

Client Sample ID: Trip Blank

Lab Sample ID: 490-169840-4

Date Collected: 03/06/19 00:01

Matrix: Water

Date Received: 03/08/19 09:00

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	ND		0.500		ug/L			03/09/19 05:47	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*94*		*70 - 130*		*03/09/19 05:47*	*1*
4-Bromofluorobenzene (Surr)	*91*		*70 - 130*		*03/09/19 05:47*	*1*
Dibromofluoromethane (Surr)	*103*		*70 - 130*		*03/09/19 05:47*	*1*
Toluene-d8 (Surr)	*115*		*70 - 130*		*03/09/19 05:47*	*1*

Method: 8260B - Volatile Organic Compounds (GC/MS)

Lab Sample ID: MB 490-579815/7
Matrix: Water
Analysis Batch: 579815

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	ND		0.500		ug/L			03/09/19 04:01	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*91*		*70 - 130*		*03/09/19 04:01*	*1*
4-Bromofluorobenzene (Surr)	*89*		*70 - 130*		*03/09/19 04:01*	*1*
Dibromofluoromethane (Surr)	*103*		*70 - 130*		*03/09/19 04:01*	*1*
Toluene-d8 (Surr)	*106*		*70 - 130*		*03/09/19 04:01*	*1*

Lab Sample ID: LCS 490-579815/3
Matrix: Water
Analysis Batch: 579815

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Benzene			20.0	21.62		ug/L		108	70 - 130		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*94*		*70 - 130*
4-Bromofluorobenzene (Surr)	*94*		*70 - 130*
Dibromofluoromethane (Surr)	*100*		*70 - 130*
Toluene-d8 (Surr)	*108*		*70 - 130*

Lab Sample ID: LCSD 490-579815/4
Matrix: Water
Analysis Batch: 579815

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Benzene			20.0	22.70		ug/L		114	70 - 130	5	12

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*99*		*70 - 130*
4-Bromofluorobenzene (Surr)	*89*		*70 - 130*
Dibromofluoromethane (Surr)	*102*		*70 - 130*
Toluene-d8 (Surr)	*117*		*70 - 130*

Lab Sample ID: 490-169785-B-1 MS
Matrix: Water
Analysis Batch: 579815

Client Sample ID: Matrix Spike
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits		
Benzene	ND		20.0	21.48		ug/L		107	55 - 147		

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*94*		*70 - 130*
4-Bromofluorobenzene (Surr)	*96*		*70 - 130*
Dibromofluoromethane (Surr)	*99*		*70 - 130*
Toluene-d8 (Surr)	*110*		*70 - 130*

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: 490-169785-C-1 MSD
Matrix: Water
Analysis Batch: 579815

Client Sample ID: Matrix Spike Duplicate
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Benzene	ND		20.0	22.68		ug/L		113	55 - 147	5	22

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*96*		*70 - 130*
4-Bromofluorobenzene (Surr)	*90*		*70 - 130*
Dibromofluoromethane (Surr)	*107*		*70 - 130*
Toluene-d8 (Surr)	*107*		*70 - 130*

QC Association Summary

Client: Chesapeake Energy Corporation
Project/Site: State L-2

TestAmerica Job ID: 490-169840-1
SDG: Property ID: 890293

GC/MS VOA

Analysis Batch: 579815

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-169840-1	EQ Blank	Total/NA	Water	8260B	
490-169840-2	MW-4	Total/NA	Water	8260B	
490-169840-3	Dup	Total/NA	Water	8260B	
490-169840-4	Trip Blank	Total/NA	Water	8260B	
MB 490-579815/7	Method Blank	Total/NA	Water	8260B	
LCS 490-579815/3	Lab Control Sample	Total/NA	Water	8260B	
LCSD 490-579815/4	Lab Control Sample Dup	Total/NA	Water	8260B	
490-169785-B-1 MS	Matrix Spike	Total/NA	Water	8260B	
490-169785-C-1 MSD	Matrix Spike Duplicate	Total/NA	Water	8260B	

Lab Chronicle

Client: Chesapeake Energy Corporation
Project/Site: State L-2

TestAmerica Job ID: 490-169840-1
SDG: Property ID: 890293

Client Sample ID: EQ Blank
Date Collected: 03/06/19 07:50
Date Received: 03/08/19 09:00

Lab Sample ID: 490-169840-1
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	5 mL	5 mL	579815	03/09/19 06:14	S1S	TAL NSH

Client Sample ID: MW-4
Date Collected: 03/06/19 10:00
Date Received: 03/08/19 09:00

Lab Sample ID: 490-169840-2
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	5 mL	5 mL	579815	03/09/19 07:34	S1S	TAL NSH

Client Sample ID: Dup
Date Collected: 03/06/19 00:01
Date Received: 03/08/19 09:00

Lab Sample ID: 490-169840-3
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	5 mL	5 mL	579815	03/09/19 08:00	S1S	TAL NSH

Client Sample ID: Trip Blank
Date Collected: 03/06/19 00:01
Date Received: 03/08/19 09:00

Lab Sample ID: 490-169840-4
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	5 mL	5 mL	579815	03/09/19 05:47	S1S	TAL NSH

Laboratory References:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

Method Summary

Client: Chesapeake Energy Corporation
Project/Site: State L-2

TestAmerica Job ID: 490-169840-1
SDG: Property ID: 890293

Method	Method Description	Protocol	Laboratory
8260B	Volatile Organic Compounds (GC/MS)	SW846	TAL NSH
5030B	Purge and Trap	SW846	TAL NSH

Protocol References:

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

Accreditation/Certification Summary

Client: Chesapeake Energy Corporation
Project/Site: State L-2

TestAmerica Job ID: 490-169840-1
SDG: Property ID: 890293

Laboratory: TestAmerica Nashville

The accreditations/certifications listed below are applicable to this report.

Authority	Program	EPA Region	Identification Number	Expiration Date
Oklahoma	State Program	6	9412	08-31-19

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
Nashville, TN

COOLER RECEIPT FORM

490-169840 Chain of Custody

490303

Cooler Received/Opened On 03-08-2019 @ 09:00

Time Samples Removed From Cooler 16:48 Time Samples Placed In Storage 16:52 (2 Hour Window)

1. Tracking # 0761 (last 4 digits, FedEx) Courier: FedEx

IR Gun ID 31470368 pH Strip Lot NA Chlorine Strip Lot NA

2. Temperature of rep. sample or temp blank when opened: 4.1 *Degrees Celsius*

3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES NO NA

4. Were custody seals on outside of cooler? YES NO NA

If yes, how many and where: 1 (front) +1 (rear)

5. Were the seals intact, signed, and dated correctly? YES NO NA

6. Were custody papers inside cooler? YES NO NA

I certify that I opened the cooler and answered questions 1-6 (intial) KA

7. Were custody seals on containers: YES NO and Intact YES NO NA

Were these signed and dated correctly? YES NO NA

8. Packing mat'l used? Bubblewrap Plastic bag Peanuts Vermiculite Foam Insert Paper Other None

9. Cooling process: Ice Ice-pack Ice (direct contact) Dry ice Other None

10. Did all containers arrive in good condition (unbroken)? YES NO NA

11. Were all container labels complete (#, date, signed, pres., etc)? YES NO NA

12. Did all container labels and tags agree with custody papers? YES NO NA

13a. Were VOA vials received? YES NO NA

b. Was there any observable headspace present in any VOA vial? YES NO NA

● ⬅ Larger than this.

14. Was there a Trip Blank in this cooler? YES NO NA If multiple coolers, sequence #_____

I certify that I unloaded the cooler and answered questions 7-14 (intial) ACE

15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? YES NO NA

b. Did the bottle labels indicate that the correct preservatives were used YES NO NA

16. Was residual chlorine present? YES NO NA

I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial) ACE

17. Were custody papers properly filled out (ink, signed, etc)? YES NO NA

18. Did you sign the custody papers in the appropriate place? YES NO NA

19. Were correct containers used for the analysis requested? YES NO NA

20. Was sufficient amount of sample sent in each container? YES NO NA

I certify that I entered this project into LIMS and answered questions 17-20 (intial) ACE

I certify that I attached a label with the unique LIMS number to each container (intial) ACE

21. Were there Non-Conformance issues at login? YES NO Was a NCM generated? YES NO #_____

BIS = Broken in shipment

CHAIN OF CUSTODY RECORD

No. 1039

EQUUS environmental solutions

PROJECT NUMBER: CHKSTATLN18001	PROJECT NAME: CHK STATE L	COC 1 of 1	
SHIPPED TO: TA-NASHVILLE	PROJECT MANAGER: DAVID BRADY	TAT: STANDARD	

SAMPLER'S PRINTED NAME: TERRY FISHER

SAMPLER'S SIGNATURE:

ASOW: N/A

Date	Time	Sample ID	Sample Matrix	# of Sample Containers	BENZENE											REMARKS
3/6/19	0750	EQ BLANK	W	3	X											
3/6/19	1000	MW-4	W	3	X											
3/6/19	—	DUP	W	3	X											
—	—	TRIP BLANK	W	3	X											

Loc: 490
169840

TOTAL NUMBER OF CONTAINERS → 12

RELINQUISHED BY:	DATE 3-7-19	RECEIVED BY:	DATE
	TIME 1400		TIME
RELINQUISHED BY:	DATE	RECEIVED BY:	DATE
	TIME		TIME

METHOD OF SHIPMENT: FEDEX

AIRBILL NUMBER: 8137 2219 0761

RECEIVED IN LABORATORY BY: 4.10 DATE 3/8/19 TIME 9:00

Send PDF, EDD, and INVOICE (if applicable) to: QAQC@EQUUSENV.COM

LABORATORY ~~CONTACT~~: 615-301-5041

LABORATORY ADDRESS: 2960 FOSTER CREIGHTON DRIVE NASHVILLE, TN 37204

POINT OF ORIGIN:

3/14/2019