

FREMONT ENVIRONMENTAL INC.

July 15, 2013

Mr. Jacob Evans
Noble Energy Inc.
1625 Broadway, Suite 2000
Denver, CO 80202

Subject: **Ground Water Monitoring Report**
 Romero Angelina 1,2
 SW ¼ NW ¼ Sec. 3 T4N R65W
 API # 05-123-12728
 La Salle, Colorado
 Fremont Project No. C010-009

Dear Mr. Evans:

Enclosed please find a copy of the above referenced Draft Ground Water Monitoring Report for the Romero Angelina site east of La Salle, Colorado. The enclosed report describes monitoring and sampling efforts to assess ground water quality at the site. Please contact me at (303) 956-8714 if you require any additional information.

Fremont appreciates the opportunity to provide this service.

Sincerely,
FREMONT ENVIRONMENTAL INC.



Paul V. Henehan, P.E.
Senior Consultant

Enclosure

GROUND WATER MONITORING AND REMEDIATION REPORT

**NOBLE ENERGY INC.
ROMERO ANGELINA 1,2
LA SALLE, COLORADO
FREMONT PROJECT NO. C010-009**

Prepared by:

**Fremont Environmental Inc.
12061 Pennsylvania Street, Suite B-101
Thornton, CO 80241
(303) 956-8714**

July 15, 2013

TABLE OF CONTENTS

1.0 INTRODUCTION	1
2.0 BACKGROUND INFORMATION	1
2.1 Site Location	1
2.2 Site History	1
3.0 GROUND WATER MONITORING AND REMEDIATION ACTIVITIES	2
3.1 Ground Water Level Measurements	2
3.2 Ground Water Sampling and Analysis	2
3.3 Ground Water Remediation System	3
4.0 DISCUSSION	3
5.0 REMARKS	4

Table

Table 1: Summary of Ground Water Chemistry and Elevation Data

Figures

Figure 1: Site Location Map

Figure 2: Site Map

Figure 3: Ground Water Contour Map

Figure 4: Ground Water Chemistry Map

Appendices

Appendix A: Sampling Plan

Appendix B: Laboratory Documentation

GROUND WATER MONITORING AND REMEDIATION REPORT

**NOBLE ENERGY INC.
ROMERO ANGELINA 1,2
LA SALLE, COLORADO
FREMONT PROJECT NO. C010-009**

1.0 INTRODUCTION

The purpose of this document is to present ground water quality data collected subsequent to remediation efforts at the Romero Angelina 1,2 site in La Salle, Colorado. Soil impacts were identified at this facility and soil remediation was accomplished by extensive excavation of impacted soil in October 2010. In addition, ground water impacts have been observed at this site since the initial excavation work was conducted. As a result, an air sparging and passive soil vapor extraction system was installed and activated at this site in August 2012. This system appeared to be effective in improving ground water quality, therefore, it was deactivated on February 19, 2013 and moved to a different location.

2.0 BACKGROUND INFORMATION

2.1 Site Location

The Romero Angelina 1,2 site is located approximately 1½ miles east of La Salle, Colorado in Weld County as shown on Figure 1. The site is located in a rural and agricultural area east of County Road 43 and south of County Road 48. The location is further described as the SW ¼ of the NW ¼ of Section 3, Township 4N, Range 65W.

2.2 Site History

The site is a natural gas production and oil storage facility for the Romero Angelina 1,2 wells. Historical soil impacts were observed during reconfiguration of the tanks and piping at this facility. This historically impacted soil has been attributed to releases from the concrete water pit or flow lines over the life of the facility. Ground water in the area is present at approximately three feet below the ground surface.

3.0 GROUND WATER MONITORING AND REMEDIATION ACTIVITIES

3.1 Ground Water Level Measurements

Ground water levels were measured in six monitoring wells on June 26, 2013 in accordance with the Sampling Plan included in Appendix A. The data are summarized in Table 1.

Water table contours inferred from the June 2013 data are illustrated on Figure 3. Based on these data, ground water is inferred to flow to the north. The water table gradient was calculated at approximately 0.004 feet per foot (ft/ft) for the June 2013 data.

3.2 Ground Water Sampling and Analysis

Ground water samples were collected from five monitoring wells (MW-3, MW-5, MW-6, MW-7 and MW-8) on June 26, 2013 and from three monitoring wells (MW-6, MW-7 and MW-8) on July 3, 2013 to monitor the magnitude and extent of ground water impacts at the site. The ground water samples were submitted to eAnalytical Inc. in Loveland, Colorado for analyses of benzene, toluene, ethylbenzene and xylenes (BTEX) by EPA Method 8260C. The ground water chemistry data is illustrated on Figure 4.

The laboratory data indicate that the BTEX constituents were below their respective laboratory detection limits in MW-3 and MW-5 during the June 26, 2013 sampling event. However, elevated concentrations of dissolved petroleum constituents were present in MW-6, MW-7 and MW-8; these wells had benzene concentrations of 7.7, 342, and 12.8 ug/L, respectively. As a result, these three monitoring wells were resampled the following week to confirm the presence of petroleum impacts. At that time, the benzene concentrations were <1.0, 2.6, and 30.4 ug/L, respectively. The ground water analytical data are summarized in Table 1. A copy of the laboratory reports, quality control data, and chain-of-custody documentation are presented in Appendix B.

3.3 Ground Water Remediation System

As a result of historical ground water impacts in several downgradient monitoring wells, Noble installed an air sparging (AS) and passive soil vapor extraction (SVE) system at this site in August 2012. Additional details regarding this system are provided in previous reports. Due to improving ground water quality, the AS/SVE was deactivated on February 19, 2013. Shortly thereafter, the remediation system was relocated to another location that required remediation.

4.0 DISCUSSION

Soil remediation was accomplished at the Romero Angelina 1,2 site by extensive excavation of impacted soil in October 2010. Since that time, several monitoring wells have been utilized to monitor ground water quality at the site; these have included MW-2, MW-3, MW-5, MW-6, MW-7, and MW-8.

On June 26, 2013, ground water samples were collected from five monitoring wells (MW-3, MW-5, MW-6, MW-7 and MW-8); two of these wells (MW-3 and MW-5) were below the Colorado Oil and Gas Conservation Commission (COGCC) Table 910-1 levels for BTEX. However, elevated concentrations of dissolved petroleum constituents were present in the other three wells.

An abbreviated sampling event was conducted one week later to confirm the presence of dissolved petroleum constituents in those three wells. Monitoring well MW-7, which had the highest benzene concentration on June 26, 2013, decreased from 342 ug/L to 2.6 ug /L on the July 3, 2013 sampling event. Monitoring well MW-6 decreased from 7.7 ug/L to <1.0 ug/L in the same time frame. The benzene concentration increased in MW-8 as it went from 12.8 ug/L to 30. 4 ug/L. It should be noted that the ground water elevation increased somewhat from the previous quarterly sampling event in

March 2013 which may have caused some of the fluctuation. These wells will be carefully monitored during future sampling events.

The previous improvement in ground water quality had been attributed to the operation of the AS/SVE system that was installed in August 2012. These three monitoring wells (MW-6, MW-7 and MW-8) had had concentrations that were below the COGCC limits for at least the past two quarters. Therefore, the remediation system was deactivated in February 2013.

Noble will continue to sample the ground water on a quarterly basis to monitor the ground water quality at this site. Noble will consider further remedial actions if the dissolved petroleum constituents in ground water remain elevated. This may include re-installing the AS/SVE system at the site.

Wells to be sampled include MW-3, MW-5, MW-6, MW-7 and MW-8. When the ground water quality has met the COGCC concentrations for four consecutive quarters, Noble will request closure of this site.

5.0 REMARKS

The discussion and conclusions contained in this report represent our professional opinions. These opinions are based on currently available information and are arrived at in accordance with currently accepted hydrogeologic and engineering practices at this time and location. Other than this, no warranty is implied or intended.

This report was prepared by **FREMONT ENVIRONMENTAL INC.**



Paul V. Henahan, P.E.

Senior Consultant

7/11/13
Date_____

TABLE

TABLE 1
SUMMARY OF GROUND WATER ELEVATION DATA AND CHEMISTRY DATA
NOBLE ENERGY INC.
ROMERO ANGELINO 1,2, LA SALLE, COLORADO
FREMONT PROJECT NO. C010-009

SAMPLE LOCATION	DATE	BENZENE (µg/L)	TOLUENE (µg/L)	ETHYL BENZENE (µg/L)	XYLENES (µg/L)	TOC ELEVATION (feet)	DEPTH TO GROUND WATER (ft)	GROUND WATER ELEVATION (ft)	FREE PRODUCT THICKNESS (ft)
MW-1	9/1/2010	9430	2010	532	7610	99.33	3.74	95.59	0
	6/20/2011	WD	WD	WD	WD	WD	WD	WD	WD
MW-2	9/1/2010	<1.0	<1.0	<1.0	5.43	99.13	3.62	95.51	0
	6/20/2011	NS	NS	NS	NS		4.27	94.86	0
	9/23/2011	NS	NS	NS	NS		3.21	95.92	0
	12/19/2011	<1.0	<1.0	<1.0	<1.0		3.87	95.26	0
	3/5/2013	NS	NS	NS	NS		4.85	94.28	0
	6/26/2013	NS	NS	NS	NS		4.28	94.85	0
MW-3	9/1/2010	<1.0	<1.0	<1.0	<2.0	100.00	3.62	96.38	0
	12/27/2010	<1.0	<1.0	<1.0	<1.0		4.96	95.04	0
	3/9/2011	<1.0	<1.0	<1.0	<3.0		5.54	94.46	0
	6/20/2011	<1.0	<1.0	<1.0	<3.0		4.54	95.46	0
	9/23/2011	<1.0	<1.0	<1.0	<3.0		3.71	96.29	0
	12/19/2011	<1.0	<1.0	<1.0	<1.0		4.23	95.77	0
	3/8/2012	<1.0	<1.0	<1.0	<1.0		4.95	95.05	0
	6/4/2012	<1.0	<1.0	<1.0	<1.0		4.96	95.04	0
	9/29/2012	<1.0	<1.0	<1.0	<1.0		5.34	94.66	0
	12/13/2012	<1.0	<1.0	<1.0	<1.0		4.73	95.27	0
	3/5/2013	<1.0	<1.0	<1.0	<1.0		5.20	94.80	0
	6/26/2013	<1.0	<1.0	<1.0	<1.0		4.41	95.59	0
MW-4	9/1/2010	10.4	<10	998	276	99.38	3.55	95.83	0
	6/20/2011	WD	WD	WD	WD	WD	WD	WD	WD
MW-5	9/1/2010	4.98	<10	<10	2.41	97.03	1.74	95.29	0
	6/20/2011	<1.0	<1.0	<1.0	<3.0		2.44	94.59	0
	7/27/2011	<1.0	<1.0	<1.0	<3.0		2.19	94.84	0
	9/23/2011	2.3	<1.0	<1.0	<3.0		1.25	95.78	0
	12/19/2011	12.4	13.8	<1.0	<1.0		2.01	95.02	0
	3/8/2012	<1.0	<1.0	<1.0	<1.0		2.93	94.10	0
	6/4/2012	879	<1.0	<1.0	<1.0		2.76	94.27	0
	9/29/2012	<1.0	<1.0	<1.0	<1.0		NM	NM	0
	12/13/2012	<1.0	<1.0	<1.0	<1.0		2.73	94.30	0
	3/5/2013	<1.0	<1.0	<1.0	<1.0		3.22	93.81	0
MW-6	9/1/2010	<1.0	<1.0	<1.0	2.69	97.17	1.89	95.28	0
	6/20/2011	20.9	<1.0	<1.0	<3.0		2.56	94.61	0
	7/27/2011	<1.0	<1.0	<1.0	<3.0		2.29	94.88	0
	9/23/2011	<1.0	<1.0	<1.0	<3.0		1.39	95.78	0
	12/19/2011	<1.0	<1.0	<1.0	<1.0		2.12	95.05	0
	3/8/2012	383	<1.0	<1.0	<1.0		3.02	94.15	0

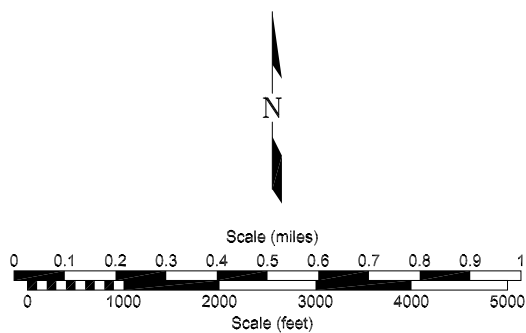
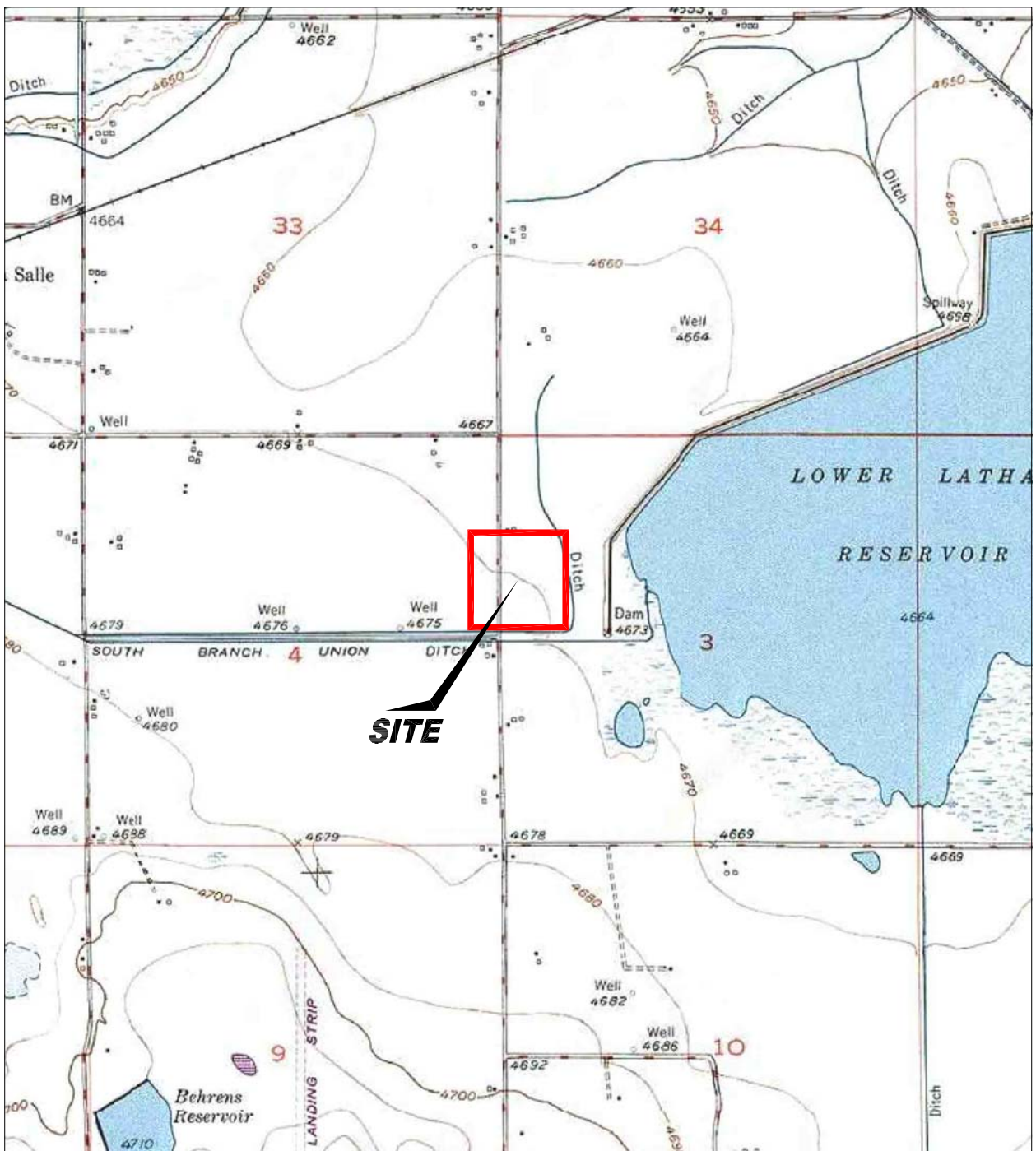
SAMPLE LOCATION	DATE	BENZENE (µg/L)	TOLUENE (µg/L)	ETHYL BENZENE (µg/L)	XYLENES (µg/L)	TOC ELEVATION (feet)	DEPTH TO GROUND WATER (ft)	GROUND WATER ELEVATION (ft)	FREE PRODUCT THICKNESS (ft)
	6/4/2012	1,052	<1.0	18.4	<1.0		2.91	94.26	0
	9/29/2012	445	1.5	<1.0	<1.0		2.91	94.26	0
	12/13/2012	<1.0	<1.0	<1.0	<1.0		2.93	94.24	0
	3/5/2013	<1.0	<1.0	<1.0	<1.0		3.26	93.91	0
	6/26/2013	7.7	<1.0	<1.0	<1.0		2.79	94.38	0
	7/3/2013	<1.0	<1.0	<1.0	<1.0		NM	NM	0
MW-7	9/1/2010	<1.0	<1.0	<1.0	<2.0	97.18	1.71	95.47	0
	12/27/2010	<1.0	<1.0	<1.0	<1.0		2.79	94.39	0
	3/9/2011	367	<1.0	4.5	21.7		3.22	93.96	0
	3/24/2011	528	<1.0	16.6	67.7		NM	NM	0
	6/20/2011	5540	1.9	216	98.4		2.43	94.75	0
	7/27/2011	4830	1.2	279	91.1		2.18	95.00	0
	9/23/2011	4330	<1.0	248	5		1.32	95.86	0
	12/19/2011	6	<1.0	<1.0	<1.0		2.01	95.17	0
	3/8/2012	1673	<1.0	18.4	189		2.91	94.27	0
	6/4/2012	542	<1.0	12.3	<1.0		2.80	94.38	0
	9/29/2012	<1.0	<1.0	<1.0	<1.0		2.94	94.24	0
	12/13/2012	<1.0	<1.0	<1.0	<1.0		3.40	93.78	0
	3/5/2013	<1.0	<1.0	<1.0	<1.0		3.19	93.99	0
	6/26/2013	342	<1.0	<1.0	33.2		2.44	94.74	0
	7/3/2013	2.6	<1.0	<1.0	35.9		NM	NM	0
MW-8	9/1/2010	<1.0	<1.0	<1.0	<2.0	97.00	1.58	95.42	0
	12/27/2010	<1.0	<1.0	<1.0	<1.0		2.60	94.40	0
	3/9/2011	<1.0	<1.0	<1.0	<3.0		3.49	93.51	0
	6/20/2011	<1.0	<1.0	<1.0	<3.0		2.27	94.73	0
	7/27/2011	<1.0	<1.0	<1.0	<3.0		1.99	95.01	0
	9/23/2011	<1.0	<1.0	<1.0	<3.0		1.16	95.84	0
	12/19/2011	<1.0	<1.0	<1.0	<1.0		1.82	95.18	0
	3/8/2012	<1.0	<1.0	<1.0	<1.0		2.70	94.30	0
	6/4/2012	<1.0	<1.0	<1.0	<1.0		2.62	94.38	0
	9/29/2012	1.5	<1.0	<1.0	<1.0		2.66	94.34	0
	12/13/2012	<1.0	<1.0	<1.0	<1.0		2.45	94.55	0
	3/5/2013	<1.0	<1.0	<1.0	<1.0		2.92	94.08	0
	6/26/2013	12.8	<1.0	<1.0	1.6		2.41	94.59	0
	7/3/2013	30.4	<1.0	<1.0	3.6		NM	NM	0
MW-9	9/1/2010	891	<10	546	6570	99.81	3.81	96.00	0
	6/20/2011	WD	WD	WD	WD	WD	WD	WD	WD
COGCC Table 910-1 Limits		5	560	700	1,400				

Values in bold exceed the COGCC concentrations

WD - Well Destroyed

NS - Not Sampled

FIGURES



USGS 7.5 MINUTE SERIES (TOPOGRAPHIC)

Figure 1
SITE LOCATION MAP

Noble Energy
Romero Angelino 1,2
La Salle, Colorado

Project No.
C010-009

Prepared by

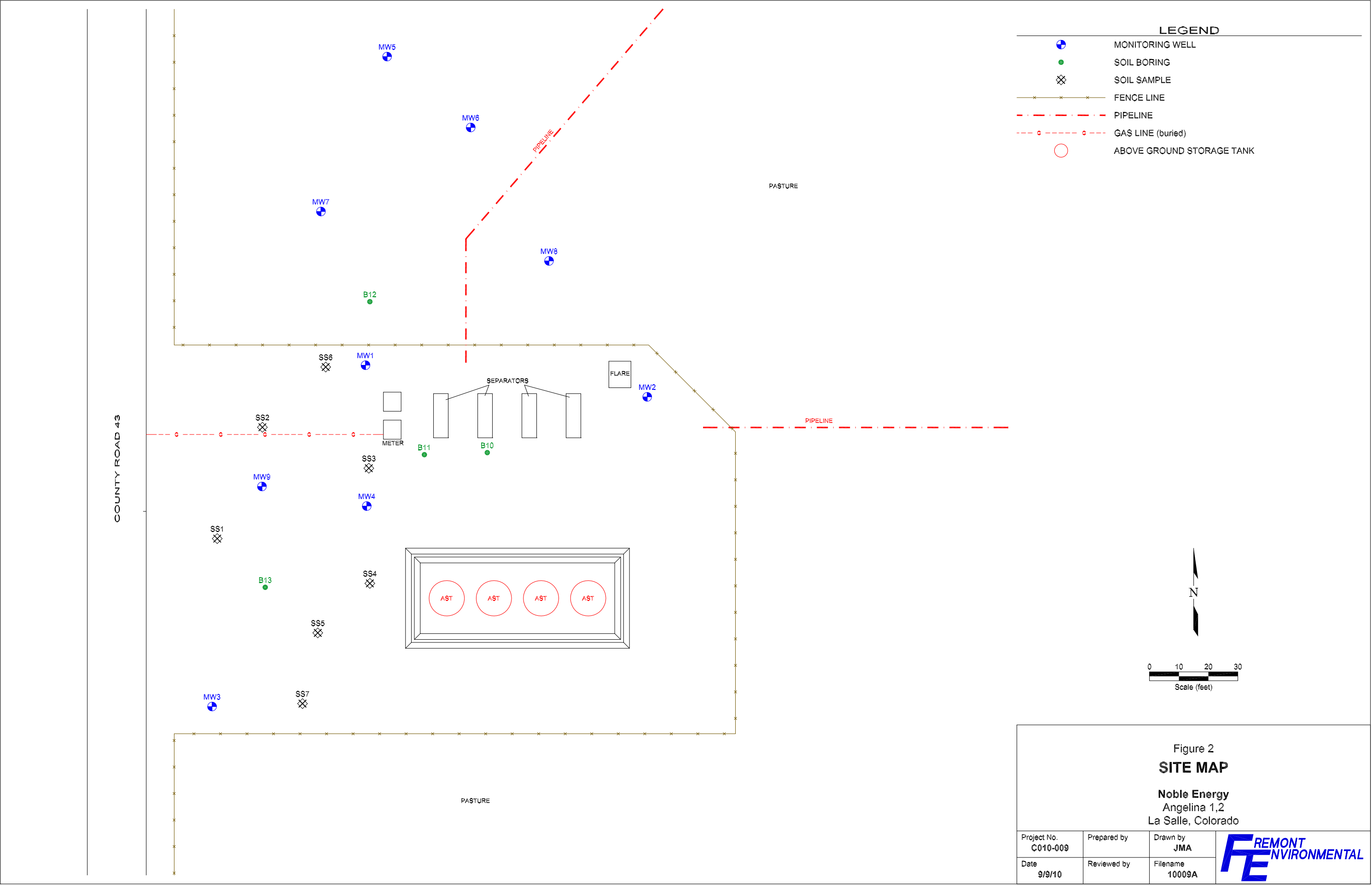
Drawn by
JMA

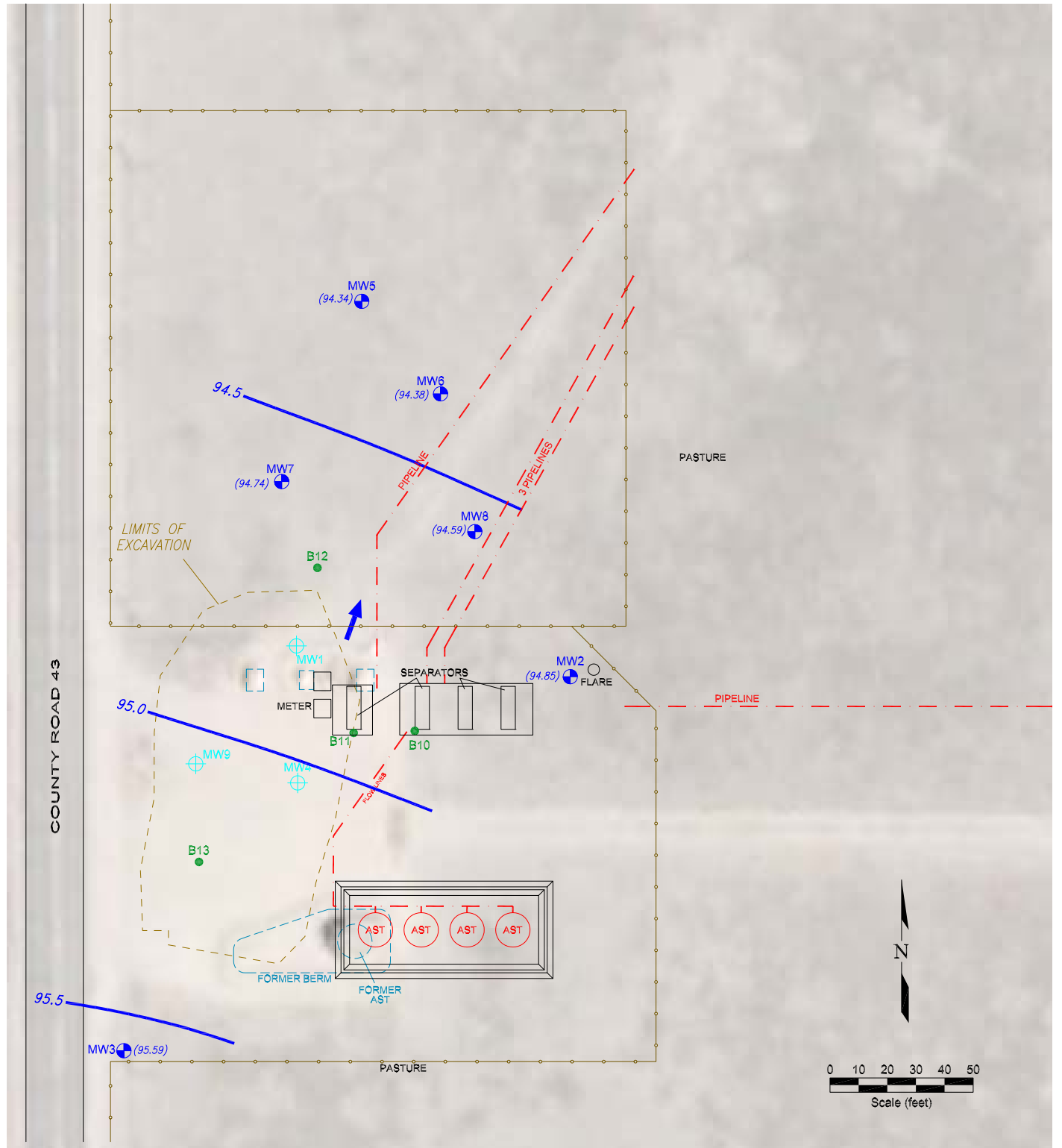
Date
9/15/10

Reviewed by

Filename
10009T







LEGEND

	MONITORING WELL	(95.42)	GROUND WATER ELEVATION (ft above arbitrary datum)
	DESTROYED MONITORING WELL	NW	NOT MEASURED
	SOIL BORING	94.5	WATER TABLE CONTOUR
	FENCE LINE		GROUND WATER FLOW DIRECTION
	PIPELINE		
	FORMER FACILITY		
	ABOVE GROUND STORAGE TANK		

Figure 3
INFERRED GROUNDWATER CONTOUR
JUNE 26, 2013

Noble Energy
Romero Angelino 1,2
La Salle, Colorado

Project No. C010-009	Prepared by	Drawn by JMA	
Date 7/15/13	Reviewed by	Filename 10009R	

APPENDIX A

SAMPLING PLAN

SAMPLING METHODS AND PROCEDURES

Water Level Measurements

All ground water level measurements will be obtained using an electric measuring device, which indicates when a probe is in contact with ground water. Measurements will be obtained by lowering the device into the well until the water surface had been encountered, and by measuring the distance from the top of the inside riser pipe to the probe. All of the measurements will be recorded to the nearest 0.01 ft. To minimize cross-contamination, the water level indicator will be decontaminated with isopropyl alcohol or distilled water between each well.

Monitoring Well Sampling

All monitoring wells were sampled from the “cleanest” to the “most contaminated” according to the protocols listed below.

Field Protocol

- Step 1 Measure water level in each well.
- Step 2 Purge each monitoring well by evacuating a minimum of three well bore volumes using a disposable polyethylene bailer.
- Step 3 Collect water samples using a disposable polyethylene bailer.
- Step 4 Cool samples to approximately 4°C for transportation.
- Step 5 Store water samples and transport to a specific laboratory, following all documentation and chain-of-custody procedures.

Upon completion of ground water sampling, a chain-of-custody log will be completed. Chain-of-custody records include the following information: project, project number, shipped by, shipped to, suspected hazard, sampling point, location, field identification number, date collected, sample type, number of containers, analysis required, and sampler's signature.

The chain-of-custody records will be shipped with the samples to the laboratory. Upon arrival at the laboratory the samples will be checked in and signed by the appropriate laboratory personnel. Laboratory identification numbers will be noted on the chain-of-custody record. Upon completion of the laboratory analysis, the completed chain-of-custody record will be returned to the project manager.

Analytical Methods

The following list identifies the various chemical constituents and analytical methods which will be used for their quantification.

<u>Chemical Parameter</u>	<u>Method</u>
Benzene, Toluene, Ethylbenzene and Total Xylenes (BTEX)	EPA Method – 8260C

APPENDIX B

LABORATORY DOCUMENTATION

Certificate of Analysis



June 27, 2013

Client: Fremont Environmental
PO Box 1289
Wellington CO 80549

Project: Romero 1,2

Lab ID: 062604

Date Received: 06/26/13

Number of Samples Received: 5

Sample Condition: Samples arrived intact and in appropriate sample containers

Sample Temperature: Within acceptable range of 2-6° C, or as specified in EPA Method

Analysis	EPA Method	Lab ID on COC
BTEX	8260C	1 - 5

All quality control analyses associated with the requested analyses were satisfactorily passed before the samples were run. If you have any questions please give us a call, we are happy to help.

Thank you for allowing eAnalytics Laboratory to provide laboratory services for you, we truly appreciate your business.

Sincerely,

A handwritten signature in black ink, appearing to read "Chris Dieken".

Christopher Dieken
Quality Assurance Manager
eAnalytics Laboratory
(970) 667-6975
info@eAnalyticsLab.com



A2LA & Department of Defense (DoD) Certified

eANALYTICS
LABORATORY

June 27, 2013

Page 2 of 5

eANALYTICS
LABORATORY

June 27, 2013

Project: Romero 1,2

Lab ID: 062604

EPA Method: 8260C BTEX

[illegible]

Todd Rhea

Laboratory Manager - eAnalytics Laboratory

Certificate of Analysis

Quality Control
Analysis

eANALYTICS
LABORATORY

June 27, 2013

Client: Fremont Environmental
PO Box 1289
Wellington CO 80549

Project: Romero 1,2

Lab ID: 062604

Matrix: WATER
Batch ID: EA 06-26-13

EPA Method: 8260C BTEX

Sample Name	Benzene	Toluene	Ethyl - Benzene	Total Xylenes	Date Analyzed	Lab ID
Laboratory Control Sample	101	103	94	98	06/26/13	L 06-26-13
(Acceptable 70-130%)	% Rec	% Rec	% Rec	% Rec		
Calibration Verification	100	95	91	99	06/26/13	C 06-26-13
(Acceptable 80-120%)	% Rec	% Rec	% Rec	% Rec		
Reagent Blank	< 1.0	< 1.0	< 1.0	< 1.0	06/26/13	RB 06-26-13
	ug/L	ug/L	ug/L	ug/L		

Todd Rhea

Laboratory Manager - eAnalytics Laboratory

Certificate of Analysis



July 9, 2013

Client: Fremont Environmental
PO Box 1289
Wellington CO 80549

Project: Romero

Lab ID: 070305

Date Received: 07/03/13

Number of Samples Received: 3

Sample Condition: Samples arrived intact and in appropriate sample containers

Sample Temperature: Within acceptable range of 2-6° C, or as specified in EPA Method

Analysis	EPA Method	Lab ID on COC
BTEX	8260C	1 - 3

All quality control analyses associated with the requested analyses were satisfactorily passed before the samples were run. If you have any questions please give us a call, we are happy to help.

Thank you for allowing eAnalytics Laboratory to provide laboratory services for you, we truly appreciate your business.

Sincerely,

A handwritten signature in black ink, appearing to read "Chris Dieken".

Christopher Dieken
Quality Assurance Manager
eAnalytics Laboratory
(970) 667-6975
info@eAnalyticsLab.com



A2LA & Department of Defense (DoD) Certified

eANALYTICS
LABORATORY

July 9, 2013

[illegible]Page 1 of 1

eANALYTICS
LABORATORY

July 9, 2013

Project: Romero

Lab ID: 070305

EPA Method: 8260C BTEX

[illegible]

Todd Rhea

Laboratory Manager - eAnalytics Laboratory

Certificate of Analysis

Quality Control
Analysis



July 9, 2013

Client: Fremont Environmental
PO Box 1289
Wellington CO 80549

Project: Romero

Lab ID: 070305

Matrix: WATER
Batch ID: EA 07-05-13

EPA Method: 8260C BTEX

Sample Name	Benzene	Toluene	Ethyl - Benzene	Total Xylenes	Date Analyzed	Lab ID
Laboratory Control Sample	96	103	98	98	07/05/13	L 07-05-13
(Acceptable 70-130%)	% Rec	% Rec	% Rec	% Rec		
Calibration Verification	101	94	93	96	07/05/13	C 07-05-13
(Acceptable 80-120%)	% Rec	% Rec	% Rec	% Rec		
Reagent Blank	< 1.0	< 1.0	< 1.0	< 1.0	07/05/13	RB 07-05-13
	ug/L	ug/L	ug/L	ug/L		

Todd Rhea

Laboratory Manager - eAnalytics Laboratory