

## **WELL INSTALLATION AND GROUNDWATER MONITORING REPORT AUGUST 2010**

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### **MCCLELLAN 3-1, 3-32, 3-35 TANK BATTERY**

LT Environmental, Inc. (LTE) was retained by Noble Energy, Inc. (Noble) to install post-remediation monitoring wells and to conduct sampling activities at the McClellan 3-1, 3-32, 3-35 Tank Battery (Site). Monitoring well installation activities and groundwater sampling occurred on June 20, 2010. Site history and remediation activities were described in the preceding *Remediation Summary Report*, dated July 2010. This well installation and groundwater monitoring event constitutes the first post remediation performance groundwater monitoring event.

LTE personnel were onsite June 15, 2010 to install three monitoring wells (MW01 through MW03) to determine if impacted groundwater exists at the Site. The monitoring wells were installed using a direct-push drill rig. The monitoring wells were advanced to a depth of 10 feet below ground surface (bgs) and were completed with a 1.5 foot stickup. Each monitoring well has 5 feet of 1-inch diameter, 0.010-inch slotted, schedule 40, poly-vinyl chloride screens. Boreholes were filled with 10-20 silica sand from total depth to one foot above the screened interval. Bentonite chips were then placed from the top of the sand pack to ground surface and were hydrated.

Lithology observed at the Site was generally brown, fine to medium grained sand. Groundwater was observed during drilling activities at approximately 5 feet bgs. Monitoring well MW03 was installed west of the excavation as an upgradient well, monitoring wells MW01 and MW02 were installed east of the excavation footprint (downgradient). The locations of the three monitoring wells relative to the excavation are presented as Figure 1. Borehole lithologic logs are included as Appendix A.

Groundwater level measurements and samples were collected from the monitoring wells on June 20, 2010 and are summarized in Table 1. The depth to groundwater ranged from 3.23 feet below top of casing (btoc) in MW02 to 4.36 feet btoc in MW01 and was used to calculate a well-specific purge volume. Samples were collected and submitted to an independent laboratory for analysis of benzene, toluene, ethylbenzene, and total xylenes (BTEX) by United States Environmental Protection Agency Method 8260B.

Analytical results from the monitoring wells, presented in Table 1, indicate BTEX concentrations are in compliance with Colorado Department of Public Health and Environment-Water Quality Control Commission Regulation 41 (WQCC Reg. 41). The laboratory analytical report is included as Appendix B.

Noble Energy would like to claim business confidentiality protection for the information submitted in this letter, the supporting materials attached and all previous and subsequent correspondence related to this matter. LTE will continue to conduct quarterly groundwater monitoring events with the goal of observing four consecutive quarters with analytical results in compliance with WQCC Reg. 41. The next quarterly groundwater sampling event is scheduled for October 2010.

## TABLE

**TABLE 1**

**GROUNDWATER ANALYTICAL DATA  
MCCLELLAN 3-1, 3-32, 3-35 TANK BATTERY  
WELD COUNTY, COLORADO  
NOBLE ENERGY, INC.**

MONITORING		DEPTH TO				
WELL	DATE	WATER (feet btoc)	BENZENE (µg/l)	TOLUENE (µg/l)	ETHYLBENZENE (µg/l)	XYLENES (µg/l)
MW01	7/20/2010	4.36	<1.0	<1.0	<1.0	<1.0
MW02	7/20/2010	3.23	<1.0	<1.0	<1.0	<1.0
MW03	7/20/2010	3.41	<1.0	<1.0	<1.0	<1.0
<b>CDPHE WQCC Reg 41</b>			<b>5.0</b>	<b>560</b>	<b>700</b>	<b>1,400</b>

**NOTES:**

btoc - below top of casing

µg/l - micrograms per liter

&lt; - indicates result is less than the stated laboratory method reporting limit

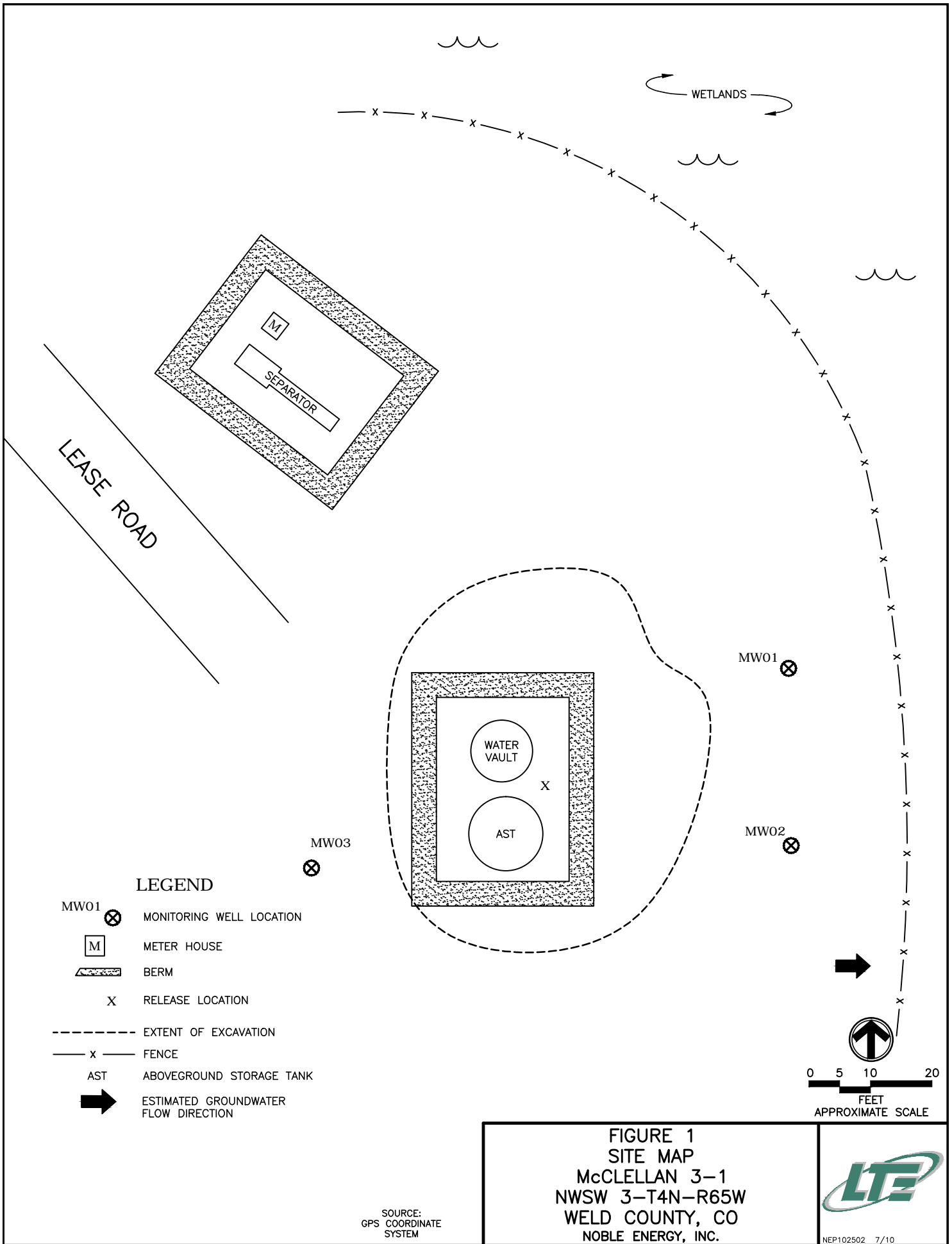
CDPHE WQCC Reg 41 - Colorado Department of Public Health and Environment - Water Quality Control

Commission Regulation 41 covering Basic Standards for Groundwater

Benzene, toluene, ethylbenzene, total xylenes analyzed by EPA Method 8260B

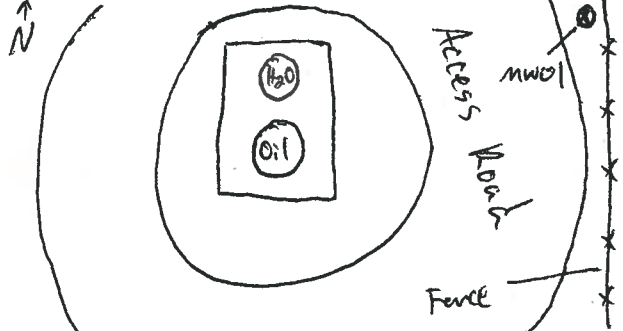


**FIGURE**



**APPENDIX A**  
**BOREHOLE LITHOLOGIC LOGS**

Well Location Sketch:



Compliance • Engineering • Remediation

LT Environmental, Inc.

4600 W. 60th Avenue

Arvada, Colorado 80003

## BORING LOG/MONITORING WELL COMPLETION DIAGRAM

Boring/Well Number: MW01	Project: McClellan 3-1
Date: 7-15-10	Project Number: NEP1025
Logged By: DG	Drilled By: Alpine
Drilling Method: Direct Push	Sampling Method: Cont.

Elevation:	Detector: Minikae 2000	Seal: Bentonite	Grout: NA
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Gravel Pack: CSSI 10x20	Diameter: 1"	Length: 6'	Hole Diameter: 2"	Depth to Liquid:
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Casing Type: Sch 40 PVC	Slot: 0.01	Diameter: 1"	Length: 5'	Total Depth: 10'	Depth to Water: 5'
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Screen Type: Sch 40 PVC					
-------------------------	--	--	--	--	--

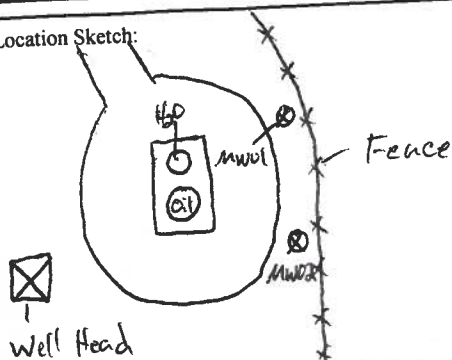
Penetration Resistance	Moisture Content	Vapor (ppm)	Staining	Sample #	Depth (ft. bgs.)	Sample Run	Recovery	Soil/Rock Type	Lithology/Remarks	Well Completion Diagram
------------------------	------------------	-------------	----------	----------	------------------	------------	----------	----------------	-------------------	-------------------------

					0					
					2					
					4					
					6					
					8					
					10					
					12					
					14					
					16					
					18					
					20					
					22					
					24					
					26					
					28					
					30					
					32					
					34					
					36					
					38					

- Brown organic silt grading downward to fine sand, moist - very moist, no staining, no odor  
 - Light brown medium sand, wet, no staining, no odor



Well Location Sketch:



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 4600 W. 60th Avenue  
 Arvada, Colorado 80003

## BORING LOG/MONITORING WELL COMPLETION DIAGRAM

Boring/Well Number: *MW02* Project: *McClellan 3-1*  
 Date: *7-15-10* Project Number: *NEP1025*  
 Logged By: *DG* Drilled By: *Alpine*  
 Drilling Method: *Direct Push* Sampling Method: *Cont.*  
 Seal: *Bentonite* Grout: *NA*

Elevation: Detector: *Minipac 2000*Gravel Pack:  
CSSI 10x20Diameter: *1"* Length: *6'*Hole Diameter: *2"* Depth to Liquid:

Casing Type:

Sch 40 PVC

Diameter: *1"* Length: *5'*Total Depth: *10'* Depth to Water: *5'*

Screen Type:

Sch 40 PVC

Slot: *0.01*

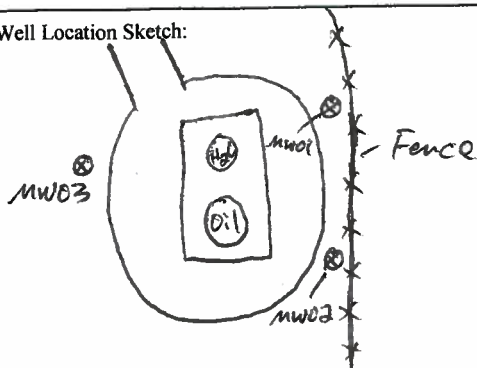
Penetration Resistance	Moisture Content	Vapor (ppm)	Staining	Sample #	Depth (ft. bgs.)	Sample Run	Recovery	Soil/Rock Type	Lithology/Remarks	Well Completion Diagram
	Moist	785			0					
	Wet	2.2			2					
					4					
					6					
					8					
					10					
					12					
					14					
					16					
					18					
					20					
					22					
					24					
					26					
					28					
					30					
					32					
					34					
					36					
					38					

- Light brown fine-medium sand, moist-very moist, staining from 4'-4.5', mild odor  
 - Same as above, wet





Well Location Sketch:



Compliance · Engineering · Remediation

LT Environmental, Inc.

4600 W. 60th Avenue

Arvada, Colorado 80003

## BORING LOG/MONITORING WELL COMPLETION DIAGRAM

Boring/Well Number:

MW03

Project:

McClellan 3-1

Date:

7-15-10

Project Number:

NEP1025

Logged By:

DG

Drilled By:

Alpine

Elevation:

Detector:

Minikae 2000

Drilling Method:

Direct Push

Sampling Method:

Cont.

Gravel Pack:

CSSI 10x20

Seal:

Bentonite

Grout:

NA

Casing Type:

Sch 40 PVC

Diameter:

1"

Length:

6'

Hole Diameter:

2"

Depth to Liquid:

Screen Type:

Sch 40 PVC

Slot:

0.01

Diameter:

1"

Length:

5'

Total Depth:

10'

Depth to Water:

5'

Penetration Resistance	Moisture Content	Vapor (ppm)	Staining	Sample #	Depth (ft. bgs.)	Sample Run	Recovery	Soil/Rock Type	Lithology/Remarks	Well Completion Diagram
					0					
					2			SC	- Brown organic sandy clay, slightly moist, low plastic, no staining, no odor	
	Moist	2.1			4				Light brown medium sand, moist, very moist, no staining, no odor	
					6			SP	- Same as above, grades to coarse sand downward, wet	
	Wet	2.4			8					
					10					
					12					
					14					
					16					
					18					
					20					
					22					
					24					
					26					
					28					
					30					
					32					
					34					
					36					
					38					

**APPENDIX B**  
**LABORATORY ANALYTICAL REPORT**



07/23/2010

LT Environmental, Inc.

Matthew Harrison

4600 West 60th Avenue

Arvada

CO

80003

Project Name- Noble - McClellan 3-1

Project Number- NEPI025

Attached are your analytical results for Noble - McClellan 3-1 received by Origins Laboratory, Inc. July 20, 2010 4:45 pm. This project is associated with Origins project number X007162-01.

The analytical results in the following report were analyzed under the guidelines of EPA Methods specified in SW-846. The analytical results apply specifically to the samples and analyses specified per the attached Chain of Custody.

Thank you for selecting Origins for your analytical needs. Please contact us with any questions concerning this report, or if we can help with anything at all.

Origins Laboratory, Inc.

303.433.1322

o-squad@oelabinc.com



LT Environmental, Inc.  
4600 West 60th Avenue  
Arvada CO 80003

Matthew Harrison  
Project Number: NEPI025  
Project: Noble - McClellan 3-1

## CROSS REFERENCE REPORT

Sample ID	Laboratory ID	Matrix	Sampled	Date Received
MW-01	X007162-01	Water	7/20/2010 3:50:00PM	07/20/2010 16:45
MW-02	X007162-02	Water	7/20/2010 3:30:00PM	07/20/2010 16:45
MW-03	X007162-03	Water	7/20/2010 3:15:00PM	07/20/2010 16:45

Origins Laboratory, Inc.



*The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.*

Noelle E Doyle,

LT Environmental, Inc.  
4600 West 60th Avenue  
Arvada CO 80003

Matthew Harrison  
Project Number: NEP1025  
Project: Noble - McClellan 3-1

www.originslaboratory.com

X007162

page 1 of 1

Client: LTE  
Address:   
Telephone Number:   
Email Address:

Project Manager: M. Harrison  
Project Name: McClellan 3-1  
Project Number: NEP1025  
Samples Collected By: D. Burns/R. Gullet

Sample ID Description	Date Sampled	Time Sampled	# of Containers	Preservative				Matrix			Analysis	Sample Instructions	
				Unpreserved	HCl	HNO <sub>3</sub>	Other	Groundwater	Soil	Air Summa Canister #			Other
MW01	7/20/10	1550	2	X				X					1
MW02	↓	1530	↓	X				X					2
MW03	↓	1515	↓	X				X					3
													4
													5
													6
													7
													8
													9
													10

Relinquished By: [Signature] Date: 7/20/10 Time: 1615

Relinquished By: [Signature] Date: 7/20/10 Time: 1615

Turnaround Time: Same Day ☐ 24 Hr ☐ 48 Hr ☐ 72 Hr ☒ Standard ☐

Durham Baseline Method

1725 Elk Place | Denver, CO 80211 | Phone: 303.433.1322 | Fax: 303.265.9645

Origins Laboratory, Inc.

Noelle E Doyle

Noelle E Doyle,

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LT Environmental, Inc.  
4600 West 60th Avenue  
Arvada CO 80003

Matthew Harrison  
Project Number: NEPI025  
Project: Noble - McClellan 3-1

**MW-01**

**7/20/2010 3:50:00PM**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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Origins Laboratory, Inc.  
X007162-01 (Water)

**BTEX by EPA 8260B**

Benzene	ND	0.00100	mg/L	1	OG21004	07/21/2010	07/22/2010
Toluene	ND	0.00100	"	"	"	"	"
Ethylbenzene	ND	0.00100	"	"	"	"	"
Xylenes, total	ND	0.00100	"	"	"	"	"

Surrogate: 1,2-Dichloroethane-d4	105 %	73.5-130	"	"	"
Surrogate: Toluene-d8	97.5 %	79.3-113	"	"	"
Surrogate: 4-Bromofluorobenzene	99.5 %	81.5-117	"	"	"

Origins Laboratory, Inc.



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Noelle E Doyle,

LT Environmental, Inc.  
4600 West 60th Avenue  
Arvada CO 80003

Matthew Harrison  
Project Number: NEPI025  
Project: Noble - McClellan 3-1

## MW-02

7/20/2010 3:30:00PM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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Origins Laboratory, Inc.  
X007162-02 (Water)

### BTEX by EPA 8260B

Benzene	ND	0.00100	mg/L	1	OG21004	07/21/2010	07/22/2010
Toluene	ND	0.00100	"	"	"	"	"
Ethylbenzene	ND	0.00100	"	"	"	"	"
Xylenes, total	ND	0.00100	"	"	"	"	"

Surrogate: 1,2-Dichloroethane-d4	105 %	73.5-130	"	"	"
Surrogate: Toluene-d8	98.0 %	79.3-113	"	"	"
Surrogate: 4-Bromofluorobenzene	98.9 %	81.5-117	"	"	"

Origins Laboratory, Inc.



Noelle E Doyle,

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LT Environmental, Inc.  
4600 West 60th Avenue  
Arvada CO 80003

Matthew Harrison  
Project Number: NEPI025  
Project: Noble - McClellan 3-1

## MW-03

7/20/2010 3:15:00PM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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Origins Laboratory, Inc.  
X007162-03 (Water)

### BTEX by EPA 8260B

Benzene	ND	0.00100	mg/L	1	OG21004	07/21/2010	07/22/2010
Toluene	ND	0.00100	"	"	"	"	"
Ethylbenzene	ND	0.00100	"	"	"	"	"
Xylenes, total	ND	0.00100	"	"	"	"	"

Surrogate: 1,2-Dichloroethane-d4	106 %	73.5-130	"	"	"
Surrogate: Toluene-d8	98.1 %	79.3-113	"	"	"
Surrogate: 4-Bromofluorobenzene	99.5 %	81.5-117	"	"	"

Origins Laboratory, Inc.



Noelle E Doyle,

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LT Environmental, Inc.  
4600 West 60th Avenue  
Arvada CO 80003

Matthew Harrison  
Project Number: NEPI025  
Project: Noble - McClellan 3-1

## Volatile Organic Compounds by EPA Method 8260B - Quality Control Origins Laboratory, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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### Batch OG21004 - EPA 5030B

#### Blank (OG21004-BLK1)

Prepared: 07/21/2010 Analyzed: 07/22/2010

Benzene	ND	0.001	mg/L
Toluene	ND	0.001	"
Ethylbenzene	ND	0.001	"
m,p-Xylene	ND	0.002	"
o-Xylene	ND	0.001	"

Surrogate: 1,2-Dichloroethane-d4	66.0	ug/L	62.5	106	73.5-130
Surrogate: Toluene-d8	59.9	"	62.5	95.8	79.3-113
Surrogate: 4-Bromofluorobenzene	62.0	"	62.5	99.2	81.5-117

#### LCS (OG21004-BSI)

Prepared: 07/21/2010 Analyzed: 07/22/2010

Benzene	0.05	0.001	mg/L	0.0500	95.4	77.3-128
Toluene	0.05	0.001	"	0.0500	108	81.7-118

Surrogate: 1,2-Dichloroethane-d4	66.6	ug/L	62.5	106	73.5-130
Surrogate: Toluene-d8	59.7	"	62.5	95.5	79.3-113
Surrogate: 4-Bromofluorobenzene	62.0	"	62.5	99.3	81.5-117

#### LCS Dup (OG21004-BSD1)

Prepared: 07/21/2010 Analyzed: 07/22/2010

Benzene	0.05	0.001	mg/L	0.0500	92.3	77.3-128	3.32	200
Toluene	0.05	0.001	"	0.0500	105	81.7-118	3.32	200

Surrogate: 1,2-Dichloroethane-d4	66.2	ug/L	62.5	106	73.5-130
Surrogate: Toluene-d8	60.0	"	62.5	95.9	79.3-113
Surrogate: 4-Bromofluorobenzene	62.4	"	62.5	99.8	81.5-117

Origins Laboratory, Inc.



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Noelle E Doyle,

LT Environmental, Inc.  
4600 West 60th Avenue  
Arvada CO 80003

Matthew Harrison  
Project Number: NEPI025  
Project: Noble - McClellan 3-1

### Notes and Definitions

ND Analyte NOT DETECTED at or above the reporting limit  
RPD Relative Percent Difference

Origins Laboratory, Inc.



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Noelle E Doyle,