

## **GROUNDWATER MONITORING REPORT NOVEMBER 2008**

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### **STRONG 1, P-21-2, 7, 8, 9, 10J, 16, 1JI, 2JI, 7JI TANK BATTERY**

On October 31, 2008, LT Environmental, Inc. (LTE) conducted groundwater sampling, on behalf of Noble Energy, Inc., at the Strong 1, P-21-2, 7, 8, 9, 10J, 16, 1JI, 2JI, 7JI Tank Battery. This sampling event constitutes the fourth post remediation monitoring event at this site. Site history and remediation activities were described in the preceding remediation and groundwater monitoring reports.

Groundwater level measurements were collected from the monitoring wells and are summarized in Table 1. Monitoring wells (MW01, MW02, MW03 and MW04) were installed surrounding the tank battery excavation on January 11, 2008. A Monitoring Well Location Map is presented as Figure 1.

Depth to groundwater, which ranged from 7.06 feet below top of casing (btoc) in MW01 to 9.04 feet btoc in MW04, was used to calculate well-specific purge volumes. Following purging, groundwater samples were collected and preserved on ice. Samples were then submitted under strict chain of custody protocol to Origins Laboratory, Inc. of Denver, Colorado for analysis of benzene, toluene, ethylbenzene, and total xylenes (BTEX) by United States Environmental Protection Agency Method 8260B.

Groundwater analytical results indicate BTEX concentrations at monitoring wells MW01, MW02, and MW04 did not exceed the Colorado Groundwater Quality Standards (CGWQS). Monitoring well MW03 exhibited a benzene concentration of 5.44 micrograms per liter ( $\mu\text{g/L}$ ), exceeding the CGWQS standard of 5.0  $\mu\text{g/L}$ . Monitoring well MW03 also exhibited toluene, ethylbenzene and total xylenes concentrations above the laboratory detection limits but below the CGWQS. Monitoring well MW04 exhibited a total xylenes concentration above the laboratory detection limit but below the CGWQS. MW01 and MW02 did not exceed the laboratory method detection limits. Analytical results are summarized in Table 1. The laboratory analytical report is attached as an Appendix.

LTE will continue to conduct quarterly groundwater monitoring events with the goal of observing four consecutive quarters of analytical results in compliance with applicable regulatory standards. The next quarterly groundwater sampling event is scheduled for January 2009.



**TABLE**



TABLE 1

**GROUNDWATER ANALYTICAL DATA**  
**STRONG 1, P-21-2, 7, 8, 9, 10J, 16, 1JI, 2JI, 7JI TANK BATTERY**  
**WELD COUNTY, COLORADO**  
**NOBLE ENERGY, INC.**

MONITORING		DEPTH TO				
WELL	DATE	WATER (feet btoc)	BENZENE (ug/L)	TOLUENE (ug/L)	ETHYLBENZENE (ug/L)	XYLENES (ug/L)
MW01	1/18/2008	8.19	<1.0	<1.0	<1.0	<2.0
	4/17/2008	9.37	<1.0	<1.0	<1.0	<2.0
	7/18/2008	8.11	<1.0	<1.0	<1.0	<3.0
	10/31/2008	7.06	<1.0	<1.0	<1.0	<3.0
MW02	1/18/2008	8.50	<1.0	<1.0	<1.0	<2.0
	4/17/2008	9.61	<1.0	<1.0	<1.0	<2.0
	7/18/2008	8.29	<1.0	<1.0	<1.0	<3.0
	10/31/2008	7.40	<1.0	<1.0	<1.0	<3.0
MW03	1/18/2008	8.95	<1.0	<1.0	29.3	65.52
	4/17/2008	10.12	<1.0	5.55	<1.0	37.8
	7/18/2008	8.70	<b>181</b>	<1.0	5.54	13.8
	10/31/2008	7.98	<b>5.44</b>	1.29	9.24	35.91
MW04	1/18/2008	9.90	<1.0	<1.0	<1.0	<2.0
	4/17/2008	11.13	<b>34.5</b>	5.81	<1.0	18.87
	7/18/2008	9.50	<b>6.94</b>	<1.0	<1.0	<3.0
	10/31/2008	9.04	<1.0	<1.0	<1.0	2.10
<b>CGWQS</b>			<b>5.0</b>	<b>1,000</b>	<b>700</b>	<b>1,400</b>

## NOTES:

btoc - below top of casing

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

**Bold** indicates concentration exceeds the CGWQS Standard

ug/L - micrograms per liter

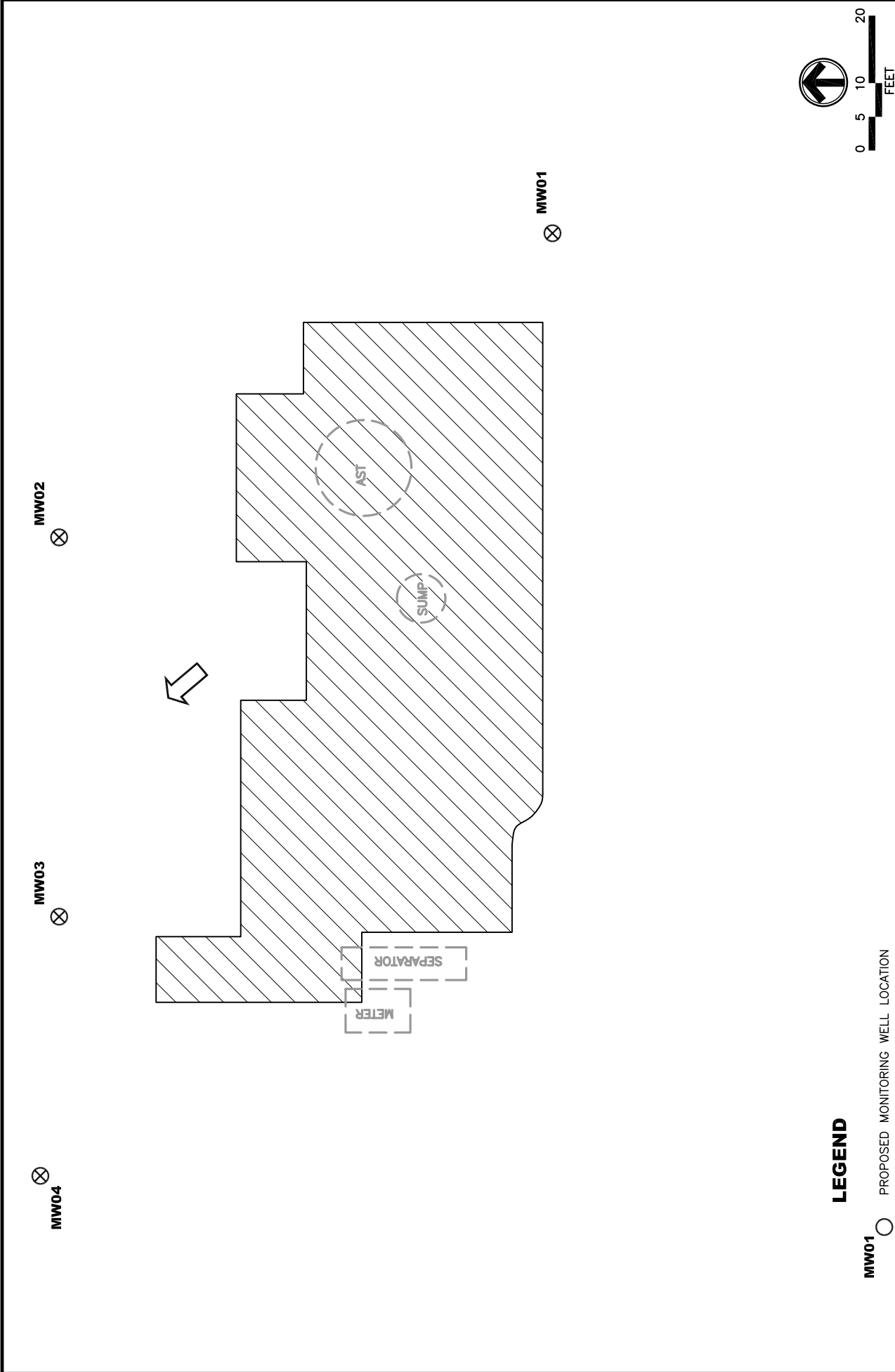
&lt; indicates result is less than the stated laboratory method detection limit

CGWQS - Colorado Groundwater Quality Standards





**FIGURE**





**LEGEND**

- MW01 ○ PROPOSED MONITORING WELL LOCATION
-  EXCAVATION AREA
-  ESTIMATED GROUNDWATER FLOW DIRECTION

SOURCE:  
LTE SKETCH

**FIGURE 1**  
**MONITORING WELL LOCATION MAP**  
**STRONG 1, P21-2, 7, 8, 9, 10J, 16, 1Jl, 2Jl, 7Jl**  
**TANK BATTERY**  
**WELD COUNTY, COLORADO**  
**NOBLE ENERGY, INC.**



**APPENDIX**  
**ANALYTICAL REPORT**





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November 04, 2008

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

Brian Dodek  
Project Number: NEP0722  
Project: Strong Tank Battery

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Attached are the analytical results for Strong Tank Battery received by Origins Laboratory, Inc. 10/31/2008 3:54:00PM. Please let us know if you have any questions, or if we can help with anything at all.

A handwritten signature in black ink, appearing to read "Noelle E Doyle", is positioned above the printed name.

Laboratory Manager  
Noelle E Doyle

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. This laboratory report is intended solely for the above addressee and it is only to be used and or reproduced in its entirety.

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Denver, Colorado 80211  
303.433.1322 | Laboratory  
303.265.9645 | Fax



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

Brian Dodek  
Project Number: NEP0722  
Project: Strong Tank Battery

#### CROSS REFERENCE REPORT

Laboratory ID	Sample ID	Matrix	Sampled	Date Received
MW01	X810105-01	Water	10/31/2008 10:40:00AM	10/31/2008 15:54
MW02	X810105-02	Water	10/31/2008 10:55:00AM	10/31/2008 15:54
MW03	X810105-03	Water	10/31/2008 11:10:00AM	10/31/2008 15:54
MW04	X810105-04	Water	10/31/2008 11:25:00AM	10/31/2008 15:54

Origins Laboratory, Inc.

Noelle E Doyle, Laboratory Manager

*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.*



Brian Dodek

Project Number: NEP0722

Project: Strong Tank Battery

Project Manager - DDP  
Project Name - Strong  
Project Number - Nep 0722  
Samples Collected by - TED

Client: LTE  
Address: 4600 W. 60th Ave  
Arundel, CO 80003  
Telephone Number: ON FILE  
E-Mail Address: \_\_\_\_\_

Sample ID - Description	Date Sampled	Time Sampled	Number of Containers	Preservative					Matrix			Analysis			Sample Instructions
				Unpreserved	HCl	HNO <sub>3</sub>	Other - ICF	Groundwater	Soil	Air - Summa Canister #	Other -				
MW01	10/31	10:40	3	X	X	X	X	X						X X X X	1
MW02		10:55	3	X	X	X	X	X						X X X X	2
MW03		11:10	3	X	X	X	X	X						X X X X	3
MW04		11:25	3	X	X	X	X	X						X X X X	4
															5
															6
															7
															8
															9
															10

Relinquished by:	Date	Time	Received by:	Time	Date	Temperature Upon Receipt:	
						Temperature	Accept:
S. D.	10/31/08	15:45	[Signature]	15:45	10/31/08	24-hr	2.0
						72-hr	
Relinquished by:	Date	Time	Received by:	Time	Date	24-hr	
						72-hr	

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**MW01**

**X810105-01 (Water)**

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Notes
		Limit							

**Origins Laboratory, Inc.**

**BTEX by EPA 8260B**

Benzene	ND	0.00100	mg/L	1	8K03001	11/03/2008	11/03/2008
Toluene	ND	0.00100	"	"	"	"	"
Ethylbenzene	ND	0.00100	"	"	"	"	"
o-Xylene	ND	0.00100	"	"	"	"	"
m,p-Xylene	ND	0.00200	"	"	"	"	"

Surrogate: 1,2-Dichloroethane-d4	107 %	70.3-123	"	"	"
Surrogate: Toluene-d8	90.7 %	75.9-123	"	"	"
Surrogate: 4-Bromofluorobenzene	108 %	83-123	"	"	"

Origins Laboratory, Inc.

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Noelle E Doyle, Laboratory Manager

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**MW02**

**X810105-02 (Water)**

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Notes
		Limit							

**Origins Laboratory, Inc.**

**BTEX by EPA 8260B**

Benzene	ND	0.00100	mg/L	1	8K03001	11/03/2008	11/03/2008
Toluene	ND	0.00100	"	"	"	"	"
Ethylbenzene	ND	0.00100	"	"	"	"	"
o-Xylene	ND	0.00100	"	"	"	"	"
m,p-Xylene	ND	0.00200	"	"	"	"	"

Surrogate: 1,2-Dichloroethane-d4	103 %	70.3-123	"	"	"
Surrogate: Toluene-d8	89.8 %	75.9-123	"	"	"
Surrogate: 4-Bromofluorobenzene	105 %	83-123	"	"	"

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**MW03**

**X810105-03 (Water)**

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Notes
		Limit							

**Origins Laboratory, Inc.**

**BTEX by EPA 8260B**

Benzene	0.00544	0.00100	mg/L	1	8K03001	11/03/2008	11/03/2008
Toluene	0.00129	0.00100	"	"	"	"	"
Ethylbenzene	0.00924	0.00100	"	"	"	"	"
o-Xylene	0.00211	0.00100	"	"	"	"	"
m,p-Xylene	0.0338	0.00200	"	"	"	"	"

Surrogate: 1,2-Dichloroethane-d4	105 %	70.3-123	"	"	"
Surrogate: Toluene-d8	87.3 %	75.9-123	"	"	"
Surrogate: 4-Bromofluorobenzene	109 %	83-123	"	"	"

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Noelle E Doyle, Laboratory Manager

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**MW04**

**X810105-04 (Water)**

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Notes
		Limit							

**Origins Laboratory, Inc.**

**BTEX by EPA 8260B**

Benzene	ND	0.00100	mg/L	1	8K03001	11/03/2008	11/03/2008
Toluene	ND	0.00100	"	"	"	"	"
Ethylbenzene	ND	0.00100	"	"	"	"	"
o-Xylene	<b>0.00210</b>	0.00100	"	"	"	"	"
m,p-Xylene	ND	0.00200	"	"	"	"	"

Surrogate: 1,2-Dichloroethane-d4	104 %	70.3-123	"	"	"
Surrogate: Toluene-d8	88.5 %	75.9-123	"	"	"
Surrogate: 4-Bromofluorobenzene	106 %	83-123	"	"	"

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**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 8K03001 – EPA 5030B**

**Blank (8K03001–BLK1)**

Prepared: 11/03/2008 Analyzed: 11/03/2008

Benzene	ND	0.001	mg/L							
Toluene	ND	0.001	"							
Ethylbenzene	ND	0.001	"							
o-Xylene	ND	0.001	"							
m,p-Xylene	ND	0.002	"							
Surrogate: 1,2-Dichloroethane-d4	67.0		ug/L	62.5		107	70.3–123			
Surrogate: Toluene-d8	55.9		"	62.5		89.4	75.9–123			
Surrogate: 4-Bromofluorobenzene	67.2		"	62.5		107	83–123			

**LCS (8K03001–BS1)**

Prepared: 11/03/2008 Analyzed: 11/03/2008

Benzene	0.05	0.001	mg/L	0.0500		101	64.2–124			
Toluene	0.05	0.001	"	0.0500		94.5	63.9–119			
Surrogate: 1,2-Dichloroethane-d4	68.4		ug/L	62.5		109	70.3–123			
Surrogate: Toluene-d8	55.0		"	62.5		88.0	75.9–123			
Surrogate: 4-Bromofluorobenzene	65.6		"	62.5		105	83–123			

**Matrix Spike (8K03001–MS1)**

Source: X810104–02

Prepared: 11/03/2008 Analyzed: 11/03/2008

Benzene	0.05	0.001	mg/L	0.0500	ND	102	64.2–124			
Toluene	0.05	0.001	"	0.0500	0.0007	96.0	63.9–119			
Surrogate: 1,2-Dichloroethane-d4	68.0		ug/L	62.5		109	70.3–123			
Surrogate: Toluene-d8	56.2		"	62.5		90.0	75.9–123			
Surrogate: 4-Bromofluorobenzene	66.8		"	62.5		107	83–123			

**Matrix Spike Dup (8K03001–MSD1)**

Source: X810104–02

Prepared: 11/03/2008 Analyzed: 11/03/2008

Benzene	0.05	0.001	mg/L	0.0500	ND	100	64.2–124	1.49	25	
Toluene	0.05	0.001	"	0.0500	0.0007	93.7	63.9–119	2.43	25	
Surrogate: 1,2-Dichloroethane-d4	68.5		ug/L	62.5		110	70.3–123			
Surrogate: Toluene-d8	56.2		"	62.5		89.9	75.9–123			
Surrogate: 4-Bromofluorobenzene	66.1		"	62.5		106	83–123			

Origins Laboratory, Inc.

Noelle E Doyle, Laboratory Manager

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### Notes and Definitions

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

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