

WELL INSTALLATION AND GROUNDWATER MONITORING REPORT NOVEMBER 2008

RICE #1

LT Environmental, Inc. (LTE) was retained by Noble Energy, Inc. (Noble) to install post remediation monitoring wells and conduct sampling activities at the Rice #1 Tank Battery (Site). Monitoring well installation activities and groundwater sampling occurred on October 29, 2008, and on November 5, 2008, respectively. Site history and remediation activities were described in the preceding *Remediation Summary Report* dated October 2008.

LTE personnel were onsite October 29, 2008 to install three monitoring wells (MW01 through MW03) to determine if impacted groundwater remained at the Site. The monitoring wells were installed using a direct-push drill rig and were advanced 15 feet below ground surface (bgs). The monitoring wells were completed with one-inch diameter, 0.010-inch slotted, schedule 40, poly-vinyl chloride (PVC) casing. Boreholes were filled with 10-20 silica sand from total depth to 3 feet bgs. Bentonite chips were then placed from the sand pack to ground surface and hydrated. Two monitoring wells (MW01 and MW02) were installed northeast of the excavation footprint (downgradient). The remaining monitoring well (MW03) was installed to the south of the excavation, as an upgradient well. The location of the three monitoring wells relative to the excavation is presented as Figure 1. Borehole lithologic logs are included as Appendix A.

Groundwater level measurements were collected from the monitoring wells and are summarized in Table 1. Depth to groundwater, which ranged from 11.48 feet below top of casing (btoc) in MW01 to 12.03 feet btoc in MW02, 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.

Analytical results from the monitoring wells, presented in Table 1, indicate BTEX concentrations in both MW01 and MW02 are in compliance with Colorado Groundwater Quality Standards (CGWQS). Both wells exhibited ethylbenzene and total xylenes concentrations above laboratory method detection limits, but well below the CGWQS. Monitoring well MW03 was dry and could not be sampled. The laboratory analytical reports are included as Appendix B.

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



TABLE



TABLE 1

**GROUNDWATER ANALYTICAL DATA
RICE #1 TANK BATTERY
WELD COUNTY, COLORADO
NOBLE ENERGY, INC.**

MONITORING WELL	DATE	DEPTH TO WATER (feet btoc)	BENZENE (ug/L)	TOLUENE (ug/L)	ETHYLBENZENE (ug/L)	XYLENES (ug/L)
MW01	11/5/2008	11.48	<1.0	<1.0	2.96	8.92
MW02	11/5/2008	12.03	<1.0	<1.0	5.79	52.27
MW03	11/5/2008			Well Dry		
CGWQS			5.0	1,000	700	1,400

NOTES:

btoc - below top of casing

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

ug/L - micrograms per liter

< indicates result is less than the stated laboratory method detection limit

CGWQS - Colorado Groundwater Quality Standards



FIGURE



COUNTY ROAD 13

FORMER AST

MW01

MW02

M

SEPARATOR


MW03

LEGEND

MW01  MONITORING WELL LOCATION

 METER HOUSE

 BERM

 EXTENT OF EXCAVATION

 ESTIMATED GROUNDWATER FLOW DIRECTION

AST ABOVEGROUND STORAGE TANK

SOURCE:
GOOGLEMAP.COM

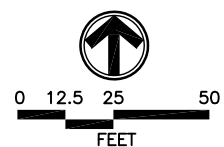


FIGURE 1
SITE MAP
RICE #1 TANK BATTERY
WELD COUNTY, COLORADO
NOBLE ENERGY, INC.

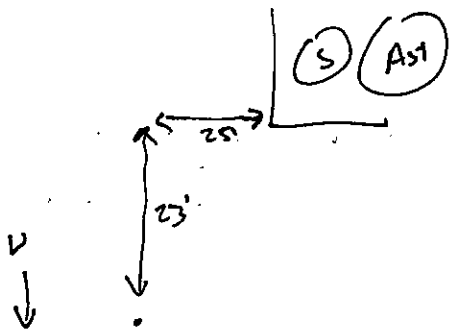


NEP083401 10/08

APPENDIX A
BOREHOLE LITHOLOGIC LOGS



Location Map:



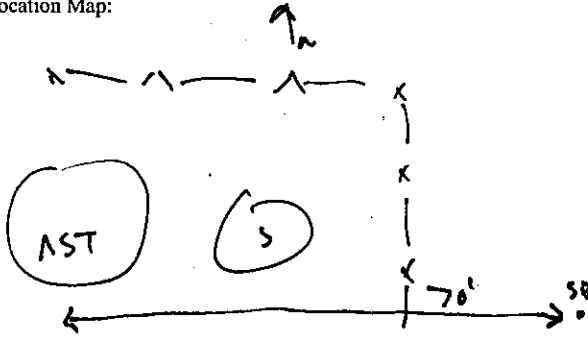
Compliance • Engineering • Remediation
 LT Environmental, Inc.
 4600 W. 460h Avenue
 Denver, Colorado 80003

BORING LOG/MONITORING WELL COMPLETION DIAGRAM

Boring/Well Number: SD01	Project: RICE 1'		
Date: 10/24	Project Number:		
Logged By: CP	Drilled By: Site Service		
Drilling Method: Direct Push	Sampling Method: Aulick liner		
Seal: Ben-lomite clay	Grout: Ben-lomite clay		
Casing Type: PVC	Diameter: 1" Length: 5'	Hole Diameter: 2.5"	Depth to Liquid:
Screen Type: PVC Slot: 10	Diameter: 1" Length: 10'	Total Depth: 15'	Depth to Water: ~7

Penetration Resistance	Moisture Content	Vapor (ppm)	Staining	Sample #	Depth (ft. bgs.)	Sample Run	Soil/Rock Type	Lithology/Remarks	Well Completion
	dry	0	no		0		CL	clay; sand (fs); light brown low plasticity	
	moist	0	no		2				
	wet		no		4		CL	SPA (same as above)	
	dry		no		6				
	dry		no		8		CL	clay; no sand (fs) moderate plasticity dark brown to black moderate odor	
	dry		no		10				
	dry		no		12				
					14				
					16				
					18				
					20				
					22				
					24				
					26				
					28				
					30				

Location Map:



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BORING LOG/MONITORING WELL COMPLETION DIAGRAM

Boring/Well Number:	SB02	Project:	RICE 1
Date:	10/24/02	Project Number:	
Logged By:	CP	Drilled By:	Site Service
Drilling Method:	Direct Push	Sampling Method:	Auger line
Gravel Pack:	10/20 silica sand	Seal:	Benbow chip
Casing Type:	PVC	Diameter:	1"
Screen Type:	PVC	Slot:	10
		Diameter:	1"
		Length:	10'
		Hole Diameter:	2.5"
		Depth to Liquid:	W3
		Total Depth:	15'
		Depth to Water:	27

Penetration Resistance	Moisture Content	Vapor (ppm)	Staining	Sample #	Depth (ft. bgs.)	Sample Run	Soil/Rock Type	Lithology/Remarks	Well Completion
	dry		no		0		SC	Sand (FS); silt. loose; medium brown	
	moist	0	no		2		CL	Sand (FS); clay; low plasticity light brown	
	wet	6	no		4		CL	SAA (same as above)	
					6				
					8				
					10				
					12		CL	SAA (same as above)	
	dry		no		14		CL	clay moderate to high plasticity	
					16				
					18				
					20				
					22				
					24				
					26				
					28				
					30				

Location Map:



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 LT Environmental, Inc.
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BORING LOG/MONITORING WELL COMPLETION DIAGRAM

Boring/Well Number:	SB03	Project:	RILE 1
Date:	10/24/08	Project Number:	
Logged By:	CP	Drilled By:	Site Services
Drilling Method:	Direct Push	Sampling Method:	Automatic liner
Gravel Pack:	10/20 silica sand	Seal:	Benbowite clay
Casing Type:	PVC	Diameter:	1" Length: 5'
Screen Type:	PVC	Slot:	1" Length: 10'
		Hole Diameter:	2.5"
		Depth to Liquid:	20'
		Total Depth:	15'
		Depth to Water:	25'

Penetration Resistance	Moisture Content	Vapor (ppm)	Staining	Sample #	Depth (ft. bgs.)	Sample Run	Soil/Rock Type	Lithology/Remarks	Well Completion
	dry	0	no		0		SM	Sand (F ₅); pebbles; silt dark brown finer	
	moist	160	no		2		SC	Sand (F ₅); clay low plasticity; poorly sorted light brown	
	wet		no		4		SC	SAND (same as above) bright color	
	dry		no		6		CL	clay; Sand (F ₅); low plasticity dark brown	
					8				
					10				
					12				
					14				
					16				
					18				
					20				
					22				
					24				
					26				
					28				
					30				

APPENDIX B
ANALYTICAL REPORT





4640 Pecos Street | Unit C | Denver, Colorado 80211
303.433.1322 Phone 303.265.9645 Fax

November 11, 2008

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

Brian Dodek
Project Number: NEP0834
Project: Rice 1

Attached are the analytical results for Rice 1 received by Origins Laboratory, Inc. 11/5/2008 5:17:00PM. 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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LT Environmental, Inc.
4600 West 60th Avenue
Arvada CO 80003

Brian Dodek
Project Number: NEP0834
Project: Rice 1

CROSS REFERENCE REPORT

Laboratory ID	Sample ID	Matrix	Sampled	Date Received
MW01	X811018-01	Water	11/5/2008 11:30:00AM	11/05/2008 17:17
MW02	X811018-02	Water	11/5/2008 11:40:00AM	11/05/2008 17:17

Origins Laboratory, Inc.

Noelle E Doyle, Laboratory Manager

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

Brian Dodek
Project Number: NEP0834
Project: Rice 1

810118X
page 1 of 1



originslaboratory.com

Client: LT Project Manager: BDD
Address: 4600 W. 60th Ave Project Name: Rice #1
Arvada, CO 80003 Project Number: NEP0834
Telephone Number: ON FILE Samples Collected by: TE
E-Mail Address: _____

Sample ID - Description	Date Sampled	Time Sampled	Number of Containers	Preservative				Matrix			Analysis	Sample Instructions
				Unpreserved	HCl	HNO ₃	Other - HCl	Groundwater	Soil	Air - Summa Canister #		
MW 01	11/5/08	11:30	2	X	X	X	X	X			X X X RTEX 8260	1
MW 02	"	11:40	3	X	X	X	X	X				2
MW 03 - Fg	"	"	3	X	X	X	X	X				3
												4
												5
												6
												7
												8
												9
												10
Relinquished by: <u>TE</u>	Date: <u>11/5/08</u>	Time: <u>11:17</u>		Received by: <u>[Signature]</u>	Date: <u>11/5/08</u>	Time: <u>17:17</u>		Temperature Upon Receipt: <u>51°</u>	Turn Awaiting Time: <u>24-hr</u>	Standard: <u>72-hr</u>		
Relinquished by: _____	Date: _____	Time: _____		Received by: _____	Date: _____	Time: _____						

4640 North Pecos Street | Unit C | Denver, Colorado 80211 | Laboratory: 303.433.1322 | Fax: 303.265.9645

Origins Laboratory, Inc.

Noelle E Doyle, Laboratory Manager

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

Brian Dodek
Project Number: NEP0834
Project: Rice 1

MW01

X811018-01 (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	8K06002	11/06/2008	11/06/2008
Toluene	ND	0.00100	"	"	"	"	"
Ethylbenzene	0.00296	0.00100	"	"	"	"	"
o-Xylene	0.00320	0.00100	"	"	"	"	"
m,p-Xylene	0.00572	0.00200	"	"	"	"	"

Surrogate: 1,2-Dichloroethane-d4	104 %	70.3-123	"	"	"
Surrogate: Toluene-d8	82.5 %	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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Arvada CO 80003

Brian Dodek
Project Number: NEP0834
Project: Rice 1

MW02

X811018-02 (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	8K06002	11/06/2008	11/06/2008
Toluene	ND	0.00100	"	"	"	"	"
Ethylbenzene	0.00579	0.00100	"	"	"	"	"
o-Xylene	0.00587	0.00100	"	"	"	"	"
m,p-Xylene	0.0464	0.00200	"	"	"	"	"

Surrogate: 1,2-Dichloroethane-d4	107 %	70.3-123	"	"	"
Surrogate: Toluene-d8	80.4 %	75.9-123	"	"	"
Surrogate: 4-Bromofluorobenzene	104 %	83-123	"	"	"

Origins Laboratory, Inc.

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LT Environmental, Inc.
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Brian Dodek
Project Number: NEP0834
Project: Rice 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 8K06002 – EPA 5030B

Blank (8K06002–BLK1)

Prepared: 11/06/2008 Analyzed: 11/06/2008

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	61.5		ug/L	62.5		98.4	70.3–123			
Surrogate: Toluene-d8	68.1		"	62.5		109	75.9–123			
Surrogate: 4-Bromofluorobenzene	68.0		"	62.5		109	83–123			

LCS (8K06002–BS1)

Prepared: 11/06/2008 Analyzed: 11/11/2008

Benzene	0.05	0.001	mg/L	0.0500		98.5	64.2–124			S–GC
Toluene	0.06	0.001	"	0.0500		111	63.9–119			S–GC
Surrogate: 1,2-Dichloroethane-d4	61.2		ug/L	62.5		97.9	70.3–123			
Surrogate: Toluene-d8	68.0		"	62.5		109	75.9–123			
Surrogate: 4-Bromofluorobenzene	69.6		"	62.5		111	83–123			

LCS Dup (8K06002–BSD1)

Prepared: 11/06/2008 Analyzed: 11/11/2008

Benzene	0.05	0.001	mg/L	0.0500		98.5	64.2–124	0.0406	200	S–GC
Toluene	0.06	0.001	"	0.0500		111	63.9–119	0.252	200	S–GC
Surrogate: 1,2-Dichloroethane-d4	59.9		ug/L	62.5		95.8	70.3–123			
Surrogate: Toluene-d8	69.4		"	62.5		111	75.9–123			
Surrogate: 4-Bromofluorobenzene	68.6		"	62.5		110	83–123			

Origins Laboratory, Inc.

Noelle E Doyle, Laboratory Manager

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Arvada CO 80003

Brian Dodek
Project Number: NEP0834
Project: Rice 1

Notes and Definitions

S-GC Surrogate recovery outside of control limits. The data was accepted based on valid recovery of the remaining surrogate.

ND Analyte NOT DETECTED at or above the reporting limit

RPD Relative Percent Difference

Origins Laboratory, Inc.

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Noelle E Doyle, Laboratory Manager