

GROUNDWATER MONITORING REPORT SEPTEMBER 2009

PHILLIPS L30-6JI

On August 4, 2009, LT Environmental, Inc. (LTE) conducted groundwater sampling on behalf of Noble Energy, Inc., at the Phillips L30-6JI Tank Battery (Site). This sampling event constitutes the first post remediation monitoring event at this Site. Site history and remediation activities were described in the preceding *Environmental Site Assessment Results, Phillips L30-6JI Tank Battery*, dated June 29, 2009.

Groundwater level measurements were collected from the monitoring wells and are summarized in Table 1. Quarterly groundwater monitoring will be accomplished using monitoring wells (SB06, SB10, SB12, SB13, SB18, and SB19) that were installed during site assessment activities. A Site Map is presented on Figure 1.

Depth to groundwater, which ranged from 2.03 feet below top of casing (btoc) in SB06 to 2.75 feet btoc in SB12, was used to calculate well-specific purge volumes. Following purging, groundwater samples were collected and preserved on ice. Samples were 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.

The Colorado Department of Public Health and Environment (CDPHE) has the Basic Standards for Groundwater in Colorado (WQCC Reg. 41) for BTEX of 5 micrograms per liter ($\mu\text{g/L}$), 560 $\mu\text{g/L}$, 700 $\mu\text{g/L}$, and 1,400 $\mu\text{g/L}$, respectively. Analytical results from the monitoring wells, presented in Table 1, indicate BTEX concentrations are below laboratory method detection limits and in compliance with WQCC Reg 41 at sample locations SB10, SB13, SB18, and SB19. Monitoring well SB06 and SB12 are the only wells that exhibited analytical results above WQCC Reg 41 standards. The benzene concentration observed at monitoring well SB06 was 33.7 micrograms per liter ($\mu\text{g/L}$) and SB12 was 130.0 $\mu\text{g/L}$ on August 4, 2009, which is above WQCC Reg 41 standard of 5.0 $\mu\text{g/L}$. It is expected that the remaining groundwater impact will dissipate due to continued bio-remediation activity promoted by the activated carbon groundwater amendment and through enhanced natural attenuation processes. The laboratory analytical reports are included as an Appendix.

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 November 2009.

TABLE

TABLE 1

GROUNDWATER ANALYTICAL DATA
PHILLIPS L30-6JI
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)
SB06	5/29/2009	3.53	<1.0	9.71	20.5	30.81
	8/4/2009	2.03	33.7	<1.00	33.4	231.6
SB10	5/29/2009	2.77	<1.0	<1.0	<1.0	<3.0
	8/4/2009	2.37	2.35	<1.00	9.88	89.5
SB12	5/29/2009	3.46	103	281	69.2	861
	8/4/2009	2.75	130	31.4	15.3	174.6
SB13	5/29/2009	3.1	<1.0	<1.0	<1.0	<3.0
	8/4/2009	2.39	<1.00	<1.00	<1.00	<3.00
SB18	5/29/2009	3.06	2.52	<1.0	<1.0	<3.0
	8/4/2009	2.4	<1.00	<1.00	<1.00	<3.00
SB19	5/29/2009	2.97	17.1	<1.0	<1.0	<3.0
	8/4/2009	2.34	<1.00	<1.00	<1.00	<3.00
CDPHE WQCC Reg 41			5.0	560	700	1,400

NOTES:

btoc - below top of casing

ug/L - micrograms per liter

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

Bold - indicates concentration exceeds the CDPHE WQCC Reg 41 standard

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



IMAGE COURTESY OF GOOGLE EARTH, 2009

LEGEND

- PRODUCTION WELLHEAD
- ✕ MONITORING WELL
- PERMEABLE REACTIVE BARRIER (PRB)
- EXCAVATION EXTENT

GROUNDWATER SAMPLES WERE
COLLECTED ON AUGUST 4, 2009.

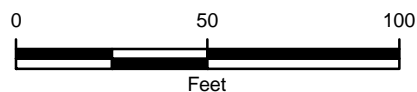


FIGURE 1
BENZENE CONCENTRATION IN GROUNDWATER
PHILLIPS L30-6JI
SEC30 - 3N - 66W
WELD COUNTY, COLORADO
NOBLE ENERGY, INC.



APPENDIX
ANALYTICAL REPORT



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

August 10, 2009

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

Brian Dodek
Project Number: NEP0909
Project: Noble – Phillips L30-6JI

Attached are the analytical results for Noble – Phillips L30-6JI received by Origins Laboratory, Inc. 8/4/2009 2:30:00PM. Please let us know if you have any questions, or if we can help with anything at all.

Noelle E Doyle
Laboratory Manager

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: NEP0909
Project: Noble – Phillips L30-6JI

CROSS REFERENCE REPORT

Sample ID	Laboratory ID	Matrix	Sampled	Date Received
SB06	X908001-01	Water	8/4/2009 11:50:00AM	08/04/2009 14:30
SB12	X908001-02	Water	8/4/2009 12:10:00PM	08/04/2009 14:30
SB13	X908001-03	Water	8/4/2009 12:00:00PM	08/04/2009 14:30
SB18	X908001-04	Water	8/4/2009 12:30:00PM	08/04/2009 14:30
SB19	X908001-05	Water	8/4/2009 12:45:00PM	08/04/2009 14:30
SB10	X908001-06	Water	8/4/2009 1:00:00PM	08/04/2009 14:30

Origins Laboratory, Inc.

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

Brian Dodek
Project Number: NEP0909
Project: Noble – Phillips L30-6J1

1008001
page 1 of 1



originslaboratory.com

Client: LT ENV.
Address: _____
Telephone Number: _____
E-Mail Address: _____
Project Manager: B. Steve Kalin
Project Name: Phillips L30-6J1
Project Number: NEP0909
Samples Collected by: M. Harrison

Sample ID - Description	Date Sampled	Time Sampled	Number of Containers	Preservative				Matrix			Analysis		Sample Instructions
				Unpreserved	HCl	HNO ₃	Other -	Groundwater	Soil	Air - Summa Canister #	Other -		
SB06	8/4/09	1150	2	X				X				1	
SB12		1210										2	
SB13		1200										3	
SB18		1230										4	
SB19		1245										5	
SB10		1300										6	
												7	
												8	
												9	
												10	
Relinquished by: <u>[Signature]</u>	Date: <u>8/4/09</u>	Time: <u>1430</u>		Received by: <u>[Signature]</u>	Date: <u>8/4/09</u>	Time: <u>1430</u>		Temperature Upon Receipt: <u>Standard</u>					
Relinquished by: <u>[Signature]</u>	Date: <u>8/4/09</u>	Time: <u>1430</u>		Received by: <u>[Signature]</u>	Date: <u>8/4/09</u>	Time: <u>1430</u>		Turn Around Time: <u>24-hr</u>					

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Origins Laboratory, Inc.

[Signature]

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

Brian Dodek
Project Number: NEP0909
Project: Noble – Phillips L30-6Jl

SB06

X908001-01 (Water)

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Notes
		Limit							

Origins Laboratory, Inc.

BTEX by EPA 8260B

Benzene	0.0337	0.00100	mg/L	1	9H05001	08/05/2009	08/05/2009
Toluene	ND	0.00100	"	"	"	"	"
Ethylbenzene	0.0334	0.00100	"	"	"	"	"
o-Xylene	0.0666	0.00100	"	"	"	"	"
m,p-Xylene	0.165	0.00200	"	"	"	"	"

Surrogate: 1,2-Dichloroethane-d4	97.0 %	85.7-134	"	"	"
Surrogate: Toluene-d8	86.3 %	81.4-121	"	"	"
Surrogate: 4-Bromofluorobenzene	96.5 %	74.7-127	"	"	"

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SB12
X908001-02 (Water)

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Notes
		Limit							

Origins Laboratory, Inc.

BTEX by EPA 8260B

Benzene	0.130	0.00100	mg/L	1	9H05001	08/05/2009	08/05/2009
Toluene	0.0314	0.00100	"	"	"	"	"
Ethylbenzene	0.0153	0.00100	"	"	"	"	"
o-Xylene	0.110	0.00100	"	"	"	"	"
m,p-Xylene	0.0646	0.00200	"	"	"	"	"

Surrogate: 1,2-Dichloroethane-d4	93.5 %	85.7-134	"	"	"
Surrogate: Toluene-d8	91.1 %	81.4-121	"	"	"
Surrogate: 4-Bromofluorobenzene	95.2 %	74.7-127	"	"	"

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SB13

X908001-03 (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	9H05001	08/05/2009	08/05/2009
Toluene	ND	0.00100	"	"	"	"	"
Ethylbenzene	ND	0.00100	"	"	"	"	"
o-Xylene	ND	0.00100	"	"	"	"	"
m,p-Xylene	ND	0.00200	"	"	"	"	"

Surrogate: 1,2-Dichloroethane-d4	96.2 %	85.7-134	"	"	"
Surrogate: Toluene-d8	92.0 %	81.4-121	"	"	"
Surrogate: 4-Bromofluorobenzene	90.2 %	74.7-127	"	"	"

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SB18
X908001-04 (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	9H05001	08/05/2009	08/05/2009
Toluene	ND	0.00100	"	"	"	"	"
Ethylbenzene	ND	0.00100	"	"	"	"	"
o-Xylene	ND	0.00100	"	"	"	"	"
m,p-Xylene	ND	0.00200	"	"	"	"	"

Surrogate: 1,2-Dichloroethane-d4	97.4 %	85.7-134	"	"	"
Surrogate: Toluene-d8	91.2 %	81.4-121	"	"	"
Surrogate: 4-Bromofluorobenzene	87.2 %	74.7-127	"	"	"

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SB19
X908001-05 (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	9H05001	08/05/2009	08/05/2009
Toluene	ND	0.00100	"	"	"	"	"
Ethylbenzene	ND	0.00100	"	"	"	"	"
o-Xylene	ND	0.00100	"	"	"	"	"
m,p-Xylene	ND	0.00200	"	"	"	"	"

Surrogate: 1,2-Dichloroethane-d4	102 %	85.7-134			"	"	"
Surrogate: Toluene-d8	90.1 %	81.4-121			"	"	"
Surrogate: 4-Bromofluorobenzene	87.2 %	74.7-127			"	"	"

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SB10
X908001-06 (Water)

Analyte	Result	Reporting		Units	Dilution	Batch	Prepared	Analyzed	Notes
		Limit							

Origins Laboratory, Inc.

BTEX by EPA 8260B

Benzene	0.00235	0.00100	mg/L	1	9H05001	08/05/2009	08/05/2009
Toluene	ND	0.00100	"	"	"	"	"
Ethylbenzene	0.00988	0.00100	"	"	"	"	"
o-Xylene	0.0542	0.00100	"	"	"	"	"
m,p-Xylene	0.0353	0.00200	"	"	"	"	"

Surrogate: 1,2-Dichloroethane-d4	101 %	85.7-134	"	"	"
Surrogate: Toluene-d8	85.9 %	81.4-121	"	"	"
Surrogate: 4-Bromofluorobenzene	100 %	74.7-127	"	"	"

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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 9H05001 – EPA 5030B

Blank (9H05001-BLK1)

Prepared: 08/05/2009 Analyzed: 08/06/2009

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	60.3		ug/L	62.5		96.5	85.7-134			
Surrogate: Toluene-d8	59.4		"	62.5		95.1	81.4-121			
Surrogate: 4-Bromofluorobenzene	70.8		"	62.5		113	74.7-127			

LCS (9H05001-BS1)

Prepared: 08/05/2009 Analyzed: 08/05/2009

Benzene	0.05	0.001	mg/L	0.0500		107	74.9-126			
Toluene	0.05	0.001	"	0.0500		102	73.3-128			
Surrogate: 1,2-Dichloroethane-d4	58.4		ug/L	62.5		93.4	85.7-134			
Surrogate: Toluene-d8	57.5		"	62.5		92.0	81.4-121			
Surrogate: 4-Bromofluorobenzene	53.8		"	62.5		86.1	74.7-127			

Matrix Spike (9H05001-MS1)

Source: X908002-01

Prepared: 08/05/2009 Analyzed: 08/05/2009

Benzene	0.06	0.001	mg/L	0.0500	ND	112	78.1-132			
Toluene	0.05	0.001	"	0.0500	ND	104	71.7-124			
Surrogate: 1,2-Dichloroethane-d4	59.9		ug/L	62.5		95.8	85.7-134			
Surrogate: Toluene-d8	56.1		"	62.5		89.8	81.4-121			
Surrogate: 4-Bromofluorobenzene	57.3		"	62.5		91.7	74.7-127			

Matrix Spike Dup (9H05001-MSD1)

Source: X908002-01

Prepared: 08/05/2009 Analyzed: 08/05/2009

Benzene	0.06	0.001	mg/L	0.0500	ND	113	78.1-132	0.799	24.8	
Toluene	0.05	0.001	"	0.0500	ND	104	71.7-124	0.0963	25	
Surrogate: 1,2-Dichloroethane-d4	60.0		ug/L	62.5		96.0	85.7-134			
Surrogate: Toluene-d8	54.3		"	62.5		86.9	81.4-121			
Surrogate: 4-Bromofluorobenzene	57.4		"	62.5		91.8	74.7-127			

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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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