



July 13, 2011

Mr. Jim Sewell  
Shell Exploration and Production Company  
4582 South Ulster Street Parkway, Suite 1400  
Denver, Colorado 80237

**RE: Second Quarter 2011 Monitoring Report  
WT Durham #4 Flowline Release  
Moffat County, Colorado**

Dear Mr. Sewell:

LT Environmental, Inc. (LTE) was retained by Shell Exploration and Production Company (Shell E & P) to conduct quarterly monitoring activities at the WT Durham #4 Flowline Release (Site). LTE collected depth to groundwater measurements and groundwater quality parameters prior to sampling. Additionally, LTE evaluated geochemical indicators to estimate natural attenuation rates.

Site history and remediation activities were described in the Form 27 Site Investigation and Remediation Workplan submitted to the Colorado Oil and Gas Conservation Commission (COGCC) on June 17, 2010, (Remediation #4990). This groundwater monitoring event constitutes the third post remediation performance monitoring event. The Site Location Map is provided as attached Figure 1.

**Depth to Groundwater Measurements**

LTE surveyed the top of casing elevations for each monitoring well on September 16, 2010. Calculating the difference in the top of casing and depth to groundwater, LTE determined the groundwater elevation in each monitoring well and created a groundwater elevation map (Figure 3). Based on the groundwater elevation map, groundwater flow on May 2, 2011 was northeast, toward Waddle Creek.

The depth to groundwater was measured in monitoring wells MW01 through MW11 on May 2, 2011, and recorded to calculate potentiometric surfaces and purge volumes. During the May 2011 sampling event, the depths to static groundwater level ranged from 2.25 feet below top of casing (BTOC) in MW01 to 3.24 feet BTOC in MW05 (Table 1).

**Groundwater Sampling Procedures**

Each monitoring well was purged of three well casing volumes prior to collection of groundwater samples. Groundwater samples were collected from each monitoring well utilizing disposable 1.6-inch diameter polyethylene bailers. Groundwater samples were collected in laboratory prepared 40-milliliter sample bottles, placed on ice, and delivered under chain-of-



custody (COC) protocol to Origins Laboratory (Origins) located in Denver, Colorado. Samples were analyzed for benzene, toluene, ethylbenzene, and total xylenes (BTEX) by United States Environmental Protection Agency (EPA) Method 8260C.

Prior to sampling, LTE conducted field screening of pH, temperature, conductivity, dissolved oxygen (DO), total dissolved solids (TDS), and oxygen reduction potential (ORP). General water quality parameters are summarized in Table 2.

In addition to BTEX, monitoring wells MW02, MW06, and MW11 were sampled for geochemical indicators. Samples were analyzed for dissolved manganese and total iron by EPA Method 6010B and sulfate and nitrate by EPA Method 300. Each of the samples (except for total iron) was collected from the monitoring wells utilizing 1.6-inch diameter polyethylene bailer.

Groundwater samples were collected for total iron analysis by advancing disposable 3/16-inch diameter polyethylene tubing below the groundwater table inside the 2-inch diameter polyvinyl chloride well casing. A peristaltic pump was utilized to collect the groundwater samples. There is no specific laboratory analysis for dissolved ferrous iron; therefore, total iron measures dissolved ferrous and ferric iron rather than ferrous iron, with the assumption that soluble ferric iron is negligible in the groundwater. At neutral pH and with exposure to air, most soluble ferrous iron will precipitate out of solution within one minute or less. Therefore, LTE filtered the iron samples with a 0.45 micron cartridge-style filter prior to placement into the laboratory-prepared sample bottles.

### **Groundwater Analytical Results**

The Colorado Department of Public Health and Environmental (CDPHE) Water Quality Control Commission (WQCC) has established Regulation 41 - Basic Standards for Ground Water for BTEX of 5.0 micrograms per liter ( $\mu\text{g/L}$ ) for benzene, 560  $\mu\text{g/L}$  for toluene, 700  $\mu\text{g/L}$  for ethylbenzene, and 1,400  $\mu\text{g/L}$  for total xylenes. Table 1 summarizes the historical groundwater analytical results for samples collected. The laboratory analytical report, laboratory quality assurance/quality control data, and COC documentation are attached.

Eleven groundwater samples were collected and submitted to Origins for BTEX analysis during the May 2011 monitoring event. Groundwater analytical results indicated that benzene was detected exceeding the CDPHE-WQCC Regulation 41 standard in monitoring wells MW06 and MW07 at concentrations of 651  $\mu\text{g/L}$  and 280  $\mu\text{g/L}$ , respectively. BTEX compounds were not detected above the laboratory method detection limits or were in compliance with CDPHE-WQCC Regulation 41 in the remaining samples. Groundwater analytical results for the May 2011 monitoring event are summarized in Table 1.



## **MONITORED NATURAL ATTENUATION EVALUATION**

LTE utilized groundwater quality parameters and geochemical indicators to determine if natural attenuation of the petroleum hydrocarbon impact to groundwater is occurring, and whether monitored natural attenuation (MNA) remains an effective remedial method to achieve site cleanup goals and what subsurface biological processes are occurring.

### **Groundwater Quality Parameter Results**

LTE personnel collected general water quality parameters during sampling activities to establish whether the appropriate site conditions existed for biodegradation. Initial field screening results indicated pH readings are within a range for optimal biodegradation. Temperature readings for each of the monitoring wells decreased significantly from the September 2010 event. The difference in temperature could be attributed to seasonal groundwater fluctuation and ambient conditions.

Inorganics that include TDS are regulated by the COGCC in groundwater. Initial field screening results indicated the TDS concentration in MW06 was 1.23 grams per liter (g/L). The TDS concentrations for monitoring wells MW02 through MW05 and MW07 through MW11 ranged from 1.19 g/L to 1.43 g/L. LTE believes the TDS concentrations observed at the Site are representative of background conditions.

DO concentrations within the plume are similar to those concentrations outside of the plume, indicating that the mass flux of DO to the groundwater from ambient air has exceeded biological oxygen demand as the aerobic microbes are likely being stimulated. However, all of the DO concentrations remain greater than 1 milligram per liter (mg/L) which indicates that oxygen is available and being utilized within the plume to promote biodegradation and natural attenuation. The data also indicated that DO concentrations in all of the monitoring wells except for MW01 have increased. This indicates aerobic conditions currently exist and biological activity is likely adjusting to the higher groundwater table and increased DO concentrations. The ORP values within the plume indicated the groundwater is oxidizing which is consistent with the increase in dissolved hydrocarbon and DO concentrations within the plume. LTE believes general water quality parameters indicate biodegradation will continue to occur at the Site but decreased during the May 2011 event.

### **Geochemical Indicators**

In order to further evaluate secondary lines of evidence to detail subsurface biodegradation processes, LTE collected groundwater samples for geochemical indicators that included manganese, total iron (representative of ferrous iron), sulfate, and nitrate. In the absence or near absence of DO, microorganisms metabolize petroleum contaminants through the use of these alternate electron acceptors. Since general groundwater quality parameters indicated DO was available throughout the Site, aerobic conditions exist at the Site. Geochemical data is summarized in Table 3.



As shown on Table 4, monitoring wells MW11, MW06, and MW02 were sampled for these electron acceptors as upgradient, in-plume, and downgradient locations, respectively. The data indicate that sulfate and manganese are currently being utilized as electron donors by subsurface microbes to promote biologically mediated anaerobic hydrocarbon oxidation of petroleum hydrocarbons. Nitrate data indicate that there is no nitrate detected upgradient, in plume, or downgradient. Data collected from the Site indicate that both iron and manganese are detected in lower concentrations upgradient, as they are being produced within the plume, and are not re-oxidized downgradient. However, the reduced species of iron ( $\text{Fe}^{+2}$ ) has largely decreased since the September 2010 monitoring event. In summary, subsurface anaerobic processes are occurring but have decreased since the September 2010 monitoring event as the electron donors are being depleted.

### **Summary and Conclusions**

As seen on Table 1, the benzene concentrations in monitoring wells MW06 and MW07 exceed the CDPHE-WQCC Regulation 41 standards. Since the September 2010 monitoring event, the benzene concentration in well MW06 has increased from 345  $\mu\text{g/L}$  to 651  $\mu\text{g/L}$ . The benzene concentration in MW07 has increased from non-detect to the laboratory reporting limit of 1  $\mu\text{g/L}$  to 280  $\mu\text{g/L}$ .

LTE surveyed the top of casing elevations for each monitoring well in September 2010 and used recent depth to water measurements to create a groundwater elevation map. On average since September 2010, sampling depths to groundwater have increased between 6.6 feet and 7.5 feet BTOC. Based on the groundwater elevation map and surrounding areas, groundwater continues to flow northeast toward Waddle Creek.

LTE utilized groundwater quality parameters and geochemical indicators to determine if biodegradation of groundwater concentrations is occurring and whether MNA is an effective remedial method to achieve site cleanup goals. Based on general water quality data, either biodegradation of benzene in groundwater has decreased or the mass flux of hydrocarbons in the plume has increased. An increase in the mass of hydrocarbons typically indicates a source is still present at the Site. During seasons when groundwater elevations are lower, MNA appears to be an appropriate remedial method to achieve site cleanup goals. However, during seasons when groundwater elevations are significantly increased, biological activity does not appear to be keeping up with the mass flux of hydrocarbons to the groundwater.

At this time, MNA does not appear to be reducing constituents of concern in a timely manner. In order to achieve site cleanup goals, LTE recommends additional source removal and/or implementation of an enhanced attenuation remediation program at the Site. Shell E & P could achieve site cleanup goals in a timely manner by removing or remediating the source *in situ*. LTE would be pleased to provide Shell E & P with several options for source removal and or enhanced attenuation of the Site. LTE will continue the quarterly monitoring program for this Site as planned with the next sampling event scheduled for August 2011.



LTE appreciates the opportunity to provide environmental services to Shell E&P. Please call us at (970) 285-9985 if you have any questions regarding this quarterly groundwater monitoring report or require additional information.

Sincerely,

LT ENVIRONMENTAL, INC.

A handwritten signature in black ink, appearing to read 'Asher'.

Asher Weinberg  
Staff Environmental Scientist

A handwritten signature in black ink, appearing to read 'Patrick J. Garland'.

Patrick J. Garland, P.G., REA  
Principal / Client Manager

Attachments

Figure 1 - Site Location Map

Figure 2 - Site Map

Figure 3 - Groundwater Elevation Map

Table 1 - Groundwater Analytical Data

Table 2 - General Water Quality Data

Table 3 - Geochemical Data

Attachment 1 - Laboratory Analytical Reports

## FIGURES





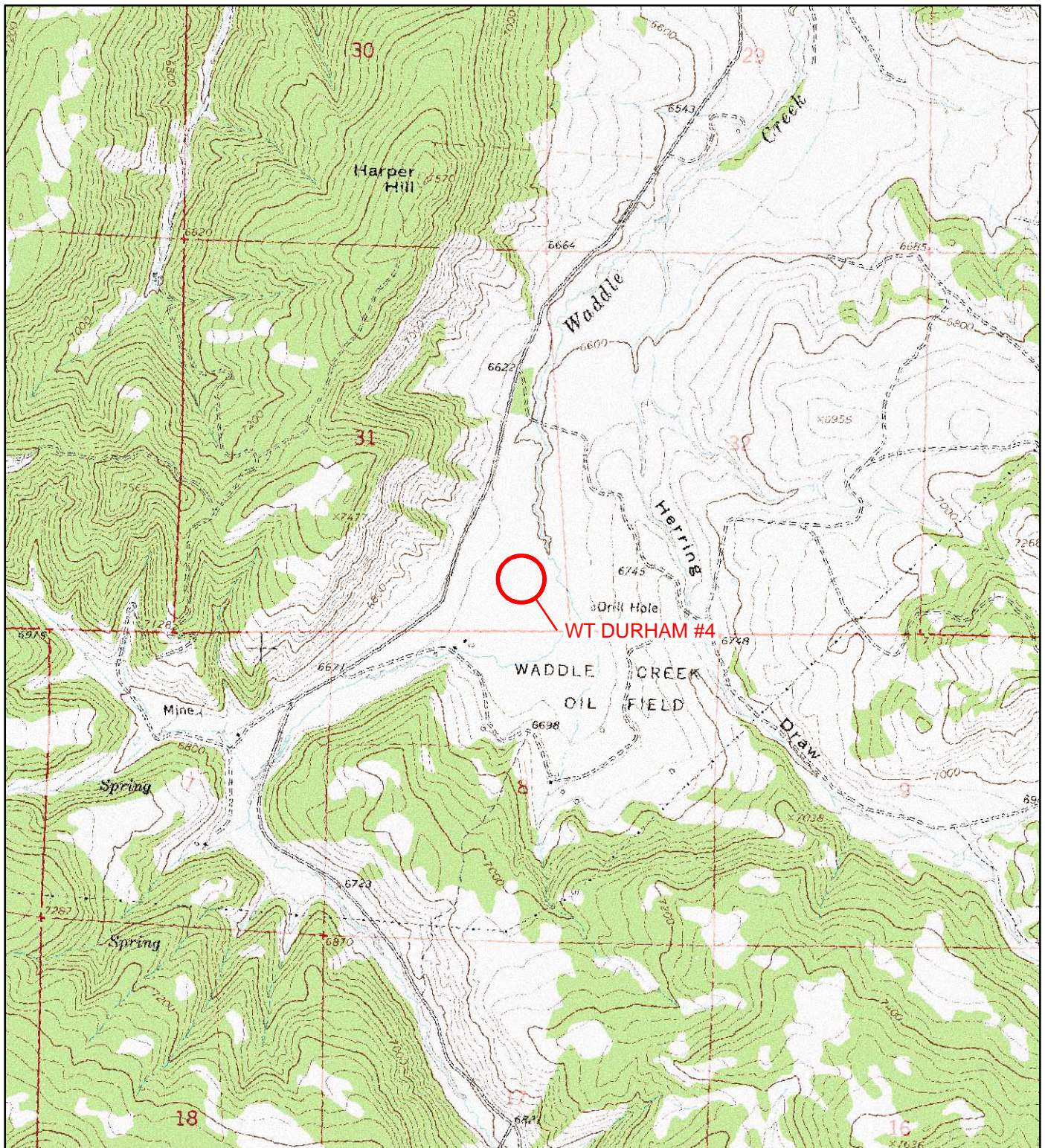

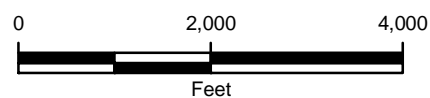


IMAGE COURTESY OF USDA/NRCS, VARIOUS DATES

# LEGEND

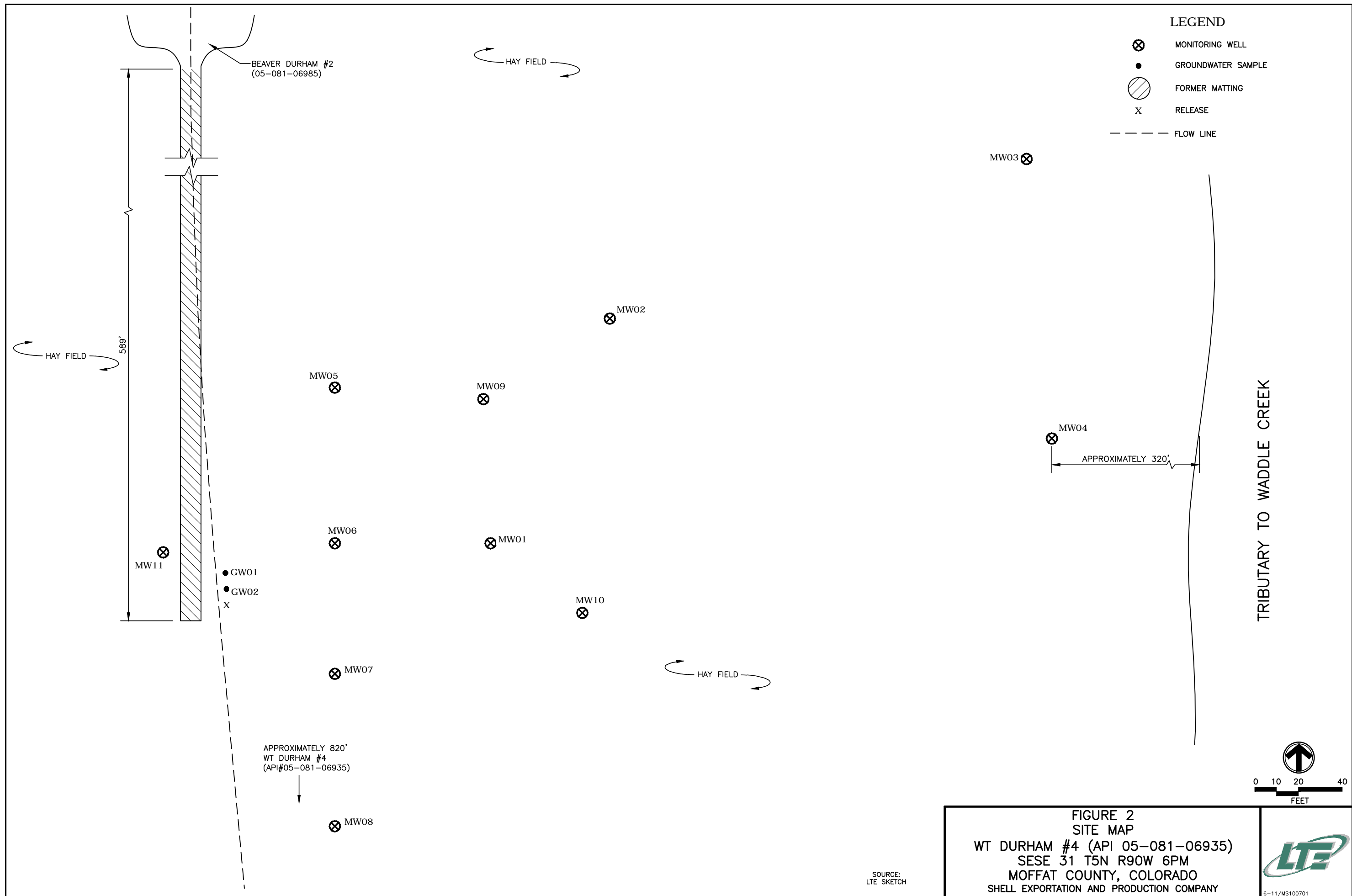
 SITE LOCATION



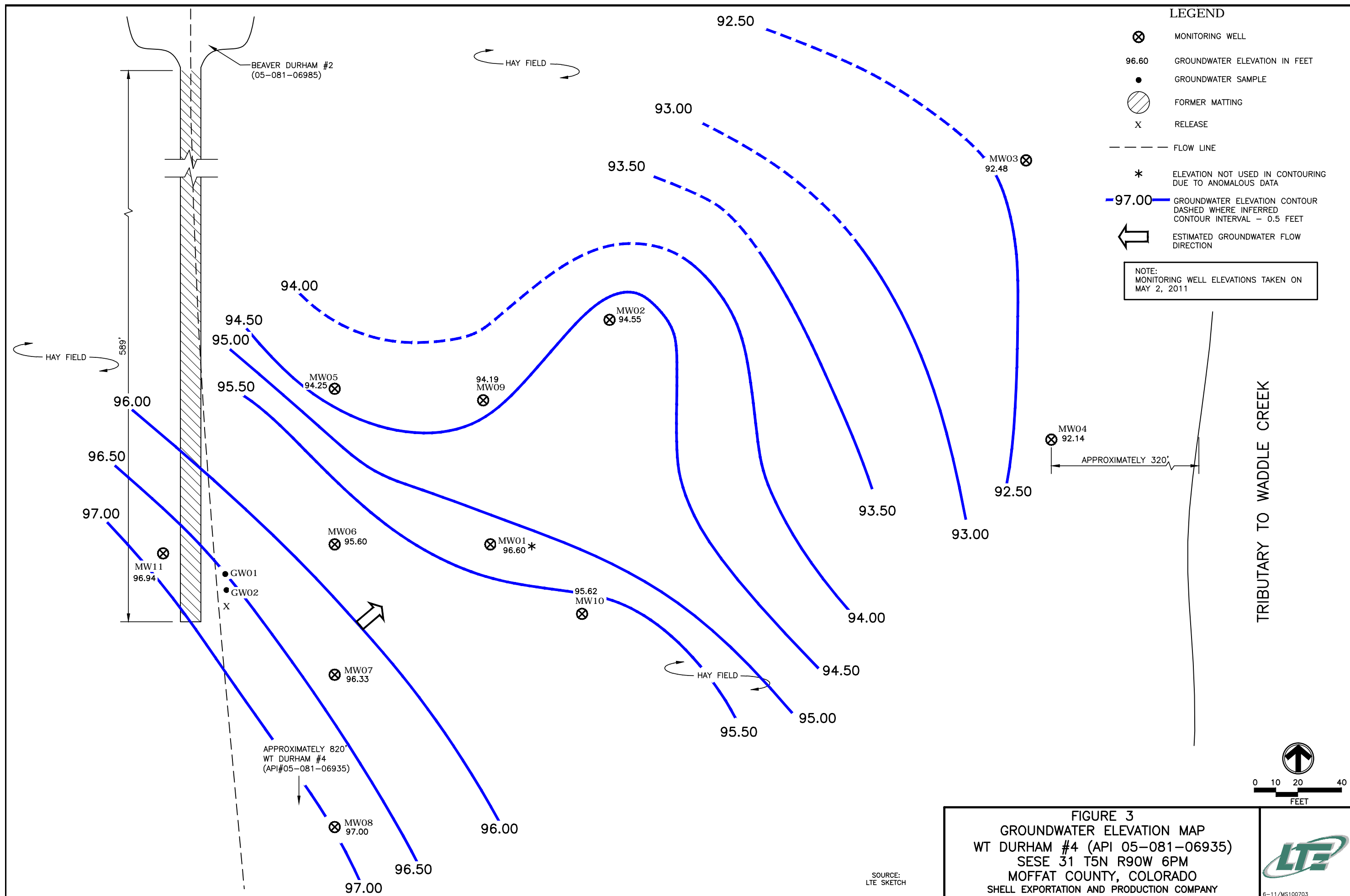
**FIGURE 1**  
**SITE LOCATION MAP**  
 WT DURHAM #4 (API 05-081-06935)  
 SESE SEC 31 T5N R90W 6PM  
 MOFFAT COUNTY, COLORADO  
 SHELL EXPLORATION AND PRODUCTION COMPANY











## TABLES



**TABLE 1**  
**GROUNDWATER ANALYTICAL DATA**  
**WT DURHAM #4**  
**MOFFAT COUNTY, COLORADO**  
**SHELL EXPLORATION AND PRODUCTION COMPANY**

Well ID	Date	Depth to Water (ft btoc)	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Total Xylenes (µg/L)
MW01	5/4/10	3.52	3.1	<2	<2	<2
	7/14/10	4.21	<b>9</b>	<1	<1	<3
	9/16/10	9.15	<b>10.1</b>	<1	<1	<3
	5/3/11	2.25	<1	<1	<1	<3
MW02	5/4/10	2.86	<2	<2	<2	<2
	7/14/10	3.65	<1	<1	<1	<3
	9/16/10	9.81	<1	<1	<1	<3
	5/3/11	3.00	<1	<1	<1	<3
MW03	5/4/10	3.30	<2	2	<2	3.3
	7/14/10	3.66	<1	<1	<1	<3
	9/16/10	9.81	<1	<1	<1	<3
	5/3/11	3.05	<1	<1	<1	<3
MW04	5/4/10	2.69	<2	2.4	<2	<2
	7/14/10	3.16	1.12	1.71	<1	<3
	9/16/10	9.83	<1	<1	<1	<3
	5/3/11	2.97	<1	<1	<1	<3
MW05	7/14/10	2.70	<1	<1	<1	<3
	9/16/10	10.01	<1	<1	<1	<3
	5/3/11	3.24	<1	<1	<1	<3
MW06	7/14/10	3.61	<b>1,520</b>	78.1	88.1	198.1
	9/16/10	9.96	<b>354</b>	<1	44.4	16.3
	5/3/11	2.88	<b>651</b>	<1	10.7	12.2
MW07	7/14/10	3.99	<b>58.7</b>	<1	1.52	8.16
	9/16/10	9.73	<1	<1	<1	<3
	5/3/11	2.97	<b>280</b>	<1	4.4	11.6
MW08	9/16/10	10.13	<1	<1	<1	<3
	5/2/11	2.84	<1	<1	<1	<3
MW09	9/16/10	10.30	<1	<1	<1	<3
	5/3/11	3.10	<1	<1	<1	<3
MW10	9/16/10	9.93	<1	<1	<1	<3
	5/3/11	3.22	<1	<1	<1	<3
MW11	9/16/10	10.05	<1	<1	<1	<3
	5/3/11	3.07	<1	<1	<1	<3
GW01	5/11/10	-	<b>1,370</b>	<b>1,730</b>	72.3	752
GW02	5/18/10	-	<b>332</b>	319	12.8	258
<b>CDPHE WQCC Reg 41</b>			<b>5</b>	<b>560</b>	<b>700</b>	<b>1,400</b>

**NOTES:**

µg/L - micrograms per liter

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

ft btoc - feet below top of well casing

**BOLD** - indicates result exceeds the applicable standard

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

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

Water Quality Control Commission Regulation 41 covering Basic Standards  
for Ground Water



**TABLE 2**  
**GENERAL WATER QUALITY DATA**  
**WT DURHAM #4**  
**MOFFAT COUNTY, COLORADO**  
**SHELL EXPLORATION AND PRODUCTION COMPANY**

Well ID	Date	pH	Temp (C°)	Conductivity (µ-S)	DO (mg/L)	ORP (mV)	TDS (g/L)
MW01	9/16/10	6.93	13.30	2,331	2.80	-49.6	1.515
	5/2/11	7.43	4.65	1,100	2.23	199.5	1.169
MW02	9/16/10	7.17	12.48	2,126	2.04	-89.4	2.4
	5/3/11	7.27	5.05	1,396	3.37	198.6	1.190
MW03	9/16/10	6.42	13.88	3,341	2.41	-84.8	2.171
	5/2/11	7.35	4.80	1,251	3.01	199.3	1.324
MW04	9/16/10	6.55	12.75	2,058	2.17	-75.5	1.338
	5/2/11	7.35	5.45	1,042	2.49	199.1	1.081
MW05	9/16/10	6.56	15.70	2,581	1.56	-107.5	1.677
	5/2/11	7.17	5.25	1,371	2.64	199.1	1.430
MW06	9/16/10	7.15	16.79	2,711	1.38	-102.3	2.4
	5/3/11	7.19	5.88	1,436	2.47	199.0	1.213
MW07	9/16/10	6.42	13.22	2,456	1.34	-53.5	1.596
	5/2/11	7.30	4.81	1,134	2.72	199.4	1.210
MW08	9/16/10	6.53	13.28	1,916	2.40	6.9	1.246
	5/2/11	7.22	5.16	977	3.15	198.5	1.022
MW09	9/16/10	6.50	14.55	2,566	3.26	-49.0	1.668
	5/2/11	7.14	4.88	1,361	2.97	200.4	1.437
MW10	9/16/10	6.56	12.85	2,017	1.90	38.6	1.311
	5/2/11	7.53	5.01	995	2.17	197.8	1.061
MW11	9/16/10	6.99	13.29	2,488	2.2	7.3	1.618
	5/3/11	7.46	4.84	1,382	2.74	198.4	1.169
<b>CDPHE WQCC Reg 41</b>		<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>&lt;1.25 x background</b>

**NOTES:**

C° - degrees celcius

DO - dissolved Oxygen

g/L - grams per liter

µ-S - micro siemens

mg/L - milligrams per liter

mV - milli volts

NA - not applicable

ORP - oxygen reduction potential

TDS - total dissolved solids

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

Control Commission Regulation 41 covering Basic Standards for Ground Water





**TABLE 3**  
**GEOCHEMICAL DATA**  
**WT DURHAM #4**  
**MOFFAT COUNTY, COLORADO**  
**SHELL EXPLORATION AND PRODUCTION COMPANY**

Well ID	Date	Manganese (µg/l)	Total Iron (µg/l)	Nitrate (mg/L)	Sulfate (mg/L)
MW02	9/16/10	356	3,310	<0.05	292
	5/3/11	360	2,190	<0.05	316
MW06	9/16/10	829	3,560	<0.05	465
	5/3/11	942	644	<0.05	384
MW11	9/16/10	317	<200	0.119	376
	5/3/11	171	<200	<0.05	259

**NOTES:**

µg/L - micrograms per liter

mg/L - milligrams per liter

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



**ATTACHMENT 1**  
**ANALYTICAL LABORATORY REPORT**





May 12, 2011

LT Environmental, Inc.

Asher Weinberg

4600 West 60th Avenue

Arvada CO 80003

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**Project Name - WT Durham #4**

**Project Number - MS1007**

Attached are you analytical results for WT Durham #4 received by Origins Laboratory, Inc. May 04, 2011. This project is associated with Origins project number X105015-01.

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



4640 North Pecos Street | Unit C | Denver, CO 80211 | Phone: 303.433.1322 | Fax: 303.265.9645

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

Project Number: MS1007  
Project Name: WT Durham #4

### CROSS REFERENCE REPORT

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW01	X105015-01	Water	May 3, 2011 9:15	05/04/2011 09:09
MW02	X105015-02	Water	May 3, 2011 9:25	05/04/2011 09:09
MW03	X105015-03	Water	May 3, 2011 9:30	05/04/2011 09:09
MW04	X105015-04	Water	May 3, 2011 9:40	05/04/2011 09:09
MW05	X105015-05	Water	May 3, 2011 9:50	05/04/2011 09:09
MW06	X105015-06	Water	May 3, 2011 10:00	05/04/2011 09:09
MW07	X105015-07	Water	May 3, 2011 10:10	05/04/2011 09:09
MW08	X105015-08	Water	May 3, 2011 10:20	05/04/2011 09:09
MW09	X105015-09	Water	May 3, 2011 10:30	05/04/2011 09:09
MW10	X105015-10	Water	May 3, 2011 10:40	05/04/2011 09:09
MW11	X105015-11	Water	May 3, 2011 10:50	05/04/2011 09:09

Origins Laboratory, Inc.



Noelle E Doyle, President

*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.*



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

Project Number: MS1007  
Project Name: WT Durham #4

www.originslaboratory.com

page 1 of 2

**ORIGINS**  
LABORATORY, INC

Client: LT Environmental  
Address: 820 Megan Avenue Unit B, Rifle, CO 81650  
Telephone Number: 970 285-9985  
Email Address: laweinberg@ltenv.com

Project Manager: Asher Weinberg  
Project Name: WT Durham #4  
Project Number: MS1007  
Samples Collected By: laweinberg@ltenv.com SS  
Steve Sivigliano

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 #			Other
MW01	5/3/2011	0915	3										1
MW02	5/3/2011	0925	6										2
MW03		0930	3										3
MW04		0940	3										4
MW05		0950	3										5
MW06		1000	6										6
MW07		1010	3										7
MW08		1020	3										8
MW09		1030	3										9
MW10		1040	3										10
Relinquished By: Steve Sivigliano	Date: 5/3/2011	Time: 1500		Received By: FED EX	Date: 5/4/11	Time: 909		Turnaround Time: Same Day <input type="checkbox"/> 24 Hr <input type="checkbox"/> 48 Hr <input type="checkbox"/> 72 Hr <input type="checkbox"/> Standard <input checked="" type="checkbox"/>					

Date Results Needed

Origins Laboratory, Inc.

*Noelle E Doyle*

Noelle E Doyle, President

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

Project Number: MS1007  
Project Name: WT Durham #4

Origins Laboratory

F-012207-01  
Effective Date: 01/22/07

## Sample Receipt Checklist

Origins Work Order: X100015

Client: LT Environmental Client Project ID: WT Durham #4

Shipped Via: FedEx Airbill #: \_\_\_\_\_  
(UPS, FedEx, Hand Delivered, Pick-up, etc.)

Matrix (Check all that apply): Soil/Solid ☒ Water ☐ Other: \_\_\_\_\_  
(Describe)

Cooler ID					
Temp (°C)	<u>1.6 °C</u>				

Thermometer ID: T001

Requirement Description	Yes	No	N/A	Comments (if any)
If samples require cooling, was the temperature just above 0°C to ≤ 6°C <sup>(1)</sup> ?	<input checked="" type="checkbox"/>			
NOTE: If samples are delivered within 5 hours of sampling, this requirement is waived provided that there is evidence that cooling has begun.				
Were all samples received intact <sup>(1)</sup> ?	<input checked="" type="checkbox"/>			
Was adequate sample volume provided <sup>(1)</sup> ?	<input checked="" type="checkbox"/>			
If custody seals are present, are they intact <sup>(1)</sup> ?			<input checked="" type="checkbox"/>	<u>No Custody seal present</u>
Are short holding time analytes or samples with HTs due within 48 hours present <sup>(1)</sup> ?	<input checked="" type="checkbox"/>			
Is a chain-of-custody (COC) present and filled out completely <sup>(1)</sup> ?	<input checked="" type="checkbox"/>			
Does the COC agree with the number and type of sample bottles received <sup>(1)</sup> ?	<input checked="" type="checkbox"/>			
Do the sample IDs on the bottle labels match the COC <sup>(1)</sup> ?	<input checked="" type="checkbox"/>			
Is the COC properly relinquished by the client with date and time recorded <sup>(1)</sup> ?	<input checked="" type="checkbox"/>			
For volatiles in water – is there headspace present? If yes, contact client and note in narrative.		<input checked="" type="checkbox"/>		
Are samples preserved that require preservation (excluding cooling) <sup>(1)</sup> ? Note the type of preservation in the Comments column (e.g., HCl).	<input checked="" type="checkbox"/>			<u>HCL, HNO3</u>
Additional Comments (if any):				
<sup>(1)</sup> If NO, then contact the client before proceeding with analysis and note in the case narrative.				

Jeff Smith  
Custodian Printed Name

Jeff Smith  
Signature or Initials of Custodian

3/14/11 9:09  
Date/Time

Origins Laboratory, Inc.

Noelle E Doyle

Noelle E Doyle, President

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.



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

Project Number: MS1007  
Project Name: WT Durham #4

MW01

5/3/2011 9:15:00AM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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Origins Laboratory, Inc.  
X105015-01 (Water)

### BTEX by EPA 8260C

Benzene	ND	1.0	ug/L	1	1E04004	05/04/2011	05/10/2011
Toluene	ND	1.0	"	"	"	"	"
Ethylbenzene	ND	1.0	"	"	"	"	"
Xylenes, total	ND	3.0	"	"	"	"	"

Surrogate: 1,2-Dichloroethane-d4	94.8 %	70-130	"	"	"
Surrogate: Toluene-d8	105 %	70-130	"	"	"
Surrogate: 4-Bromofluorobenzene	97.6 %	70-130	"	"	"

Origins Laboratory, Inc.



Noelle E Doyle, President

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LT Environmental, Inc.  
4600 West 60th Avenue

Arvada CO 80003

Project Number: MS1007

Project Name: WT Durham #4

MW02

5/3/2011 9:25:00AM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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Origins Laboratory, Inc.  
X105015-02 (Water)

## BTEX by EPA 8260C

Benzene	ND	1.0	ug/L	1	1E04004	05/04/2011	05/10/2011
Toluene	ND	1.0	"	"	"	"	"
Ethylbenzene	ND	1.0	"	"	"	"	"
Xylenes, total	ND	3.0	"	"	"	"	"

Surrogate: 1,2-Dichloroethane-d4	95.1 %	70-130			"	"	"
Surrogate: Toluene-d8	103 %	70-130			"	"	"
Surrogate: 4-Bromofluorobenzene	96.5 %	70-130			"	"	"

## Metals by SW6010B

Iron	2190	200	ug/L	1	855557	05/10/2011	05/10/2011
Manganese	360	20	"	"	"	"	"

## Nitrate by EPA 300

Nitrate as N	ND	0.05	mg/L	1	855048	05/05/2011	05/05/2011
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## Sulfate by EPA 300

Sulfate	316	0.5	mg/L	1	855048	"	05/05/2011
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Noelle E Doyle, President

LT Environmental, Inc.  
4600 West 60th Avenue

Arvada CO 80003

Project Number: MS1007

Project Name: WT Durham #4

MW03

5/3/2011 9:30:00AM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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Origins Laboratory, Inc.

X105015-03 (Water)

## BTEX by EPA 8260C

Benzene	ND	1.0	ug/L	1	1E04004	05/04/2011	05/10/2011
Toluene	ND	1.0	"	"	"	"	"
Ethylbenzene	ND	1.0	"	"	"	"	"
Xylenes, total	ND	3.0	"	"	"	"	"

Surrogate: 1,2-Dichloroethane-d4	95.6 %	70-130	"	"	"
Surrogate: Toluene-d8	103 %	70-130	"	"	"
Surrogate: 4-Bromofluorobenzene	97.2 %	70-130	"	"	"

Origins Laboratory, Inc.



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

Project Number: MS1007  
Project Name: WT Durham #4

MW04

5/3/2011 9:40:00AM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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Origins Laboratory, Inc.  
X105015-04 (Water)

### BTEX by EPA 8260C

Benzene	ND	1.0	ug/L	1	1E04004	05/04/2011	05/10/2011
Toluene	ND	1.0	"	"	"	"	"
Ethylbenzene	ND	1.0	"	"	"	"	"
Xylenes, total	ND	3.0	"	"	"	"	"

Surrogate: 1,2-Dichloroethane-d4	95.6 %	70-130	"	"	"
Surrogate: Toluene-d8	104 %	70-130	"	"	"
Surrogate: 4-Bromofluorobenzene	97.1 %	70-130	"	"	"

Origins Laboratory, Inc.



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

Project Number: MS1007  
Project Name: WT Durham #4

MW05

5/3/2011 9:50:00AM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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Origins Laboratory, Inc.  
X105015-05 (Water)

### BTEX by EPA 8260C

Benzene	ND	1.0	ug/L	1	1E04004	05/04/2011	05/10/2011
Toluene	ND	1.0	"	"	"	"	"
Ethylbenzene	ND	1.0	"	"	"	"	"
Xylenes, total	ND	3.0	"	"	"	"	"

Surrogate: 1,2-Dichloroethane-d4	95.6 %	70-130	"	"	"
Surrogate: Toluene-d8	103 %	70-130	"	"	"
Surrogate: 4-Bromofluorobenzene	96.0 %	70-130	"	"	"

Origins Laboratory, Inc.



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LT Environmental, Inc.  
4600 West 60th Avenue

Arvada CO 80003

Project Number: MS1007

Project Name: WT Durham #4

MW06

5/3/2011 10:00:00AM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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Origins Laboratory, Inc.  
X105015-06 (Water)

## BTEX by EPA 8260C

Benzene	651	10.0	ug/L	10	1E04004	05/04/2011	05/10/2011
Toluene	ND	1.0	"	1	"	"	05/10/2011
Ethylbenzene	10.7	1.0	"	"	"	"	"
Xylenes, total	12.2	3.0	"	"	"	"	"

Surrogate: 1,2-Dichloroethane-d4	92.3 %	70-130	"	"	"
Surrogate: Toluene-d8	105 %	70-130	"	"	"
Surrogate: 4-Bromofluorobenzene	98.5 %	70-130	"	"	"

## Metals by SW6010B

Iron	644	200	ug/L	1	855557	05/10/2011	05/10/2011
Manganese	942	20	"	"	"	"	"

## Nitrate by EPA 300

Nitrate as N	ND	0.05	mg/L	1	855048	05/05/2011	05/05/2011
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## Sulfate by EPA 300

Sulfate	384	0.5	mg/L	1	855048	"	05/05/2011
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LT Environmental, Inc.  
4600 West 60th Avenue  
Arvada CO 80003

Project Number: MS1007  
Project Name: WT Durham #4

MW07

5/3/2011 10:10:00AM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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Origins Laboratory, Inc.  
X105015-07 (Water)

### BTEX by EPA 8260C

Benzene	280	10.0	ug/L	10	1E04004	05/04/2011	05/10/2011
Toluene	ND	1.0	"	1	"	"	05/10/2011
Ethylbenzene	4.4	1.0	"	"	"	"	"
Xylenes, total	11.6	3.0	"	"	"	"	"

Surrogate: 1,2-Dichloroethane-d4	94.4 %	70-130	"	"	"
Surrogate: Toluene-d8	105 %	70-130	"	"	"
Surrogate: 4-Bromofluorobenzene	97.6 %	70-130	"	"	"

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

Project Number: MS1007  
Project Name: WT Durham #4

MW08

5/3/2011 10:20:00AM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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Origins Laboratory, Inc.  
X105015-08 (Water)

### BTEX by EPA 8260C

Benzene	ND	1.0	ug/L	1	1E04004	05/04/2011	05/10/2011
Toluene	ND	1.0	"	"	"	"	"
Ethylbenzene	ND	1.0	"	"	"	"	"
Xylenes, total	ND	3.0	"	"	"	"	"

Surrogate: 1,2-Dichloroethane-d4	96.1 %	70-130	"	"	"
Surrogate: Toluene-d8	104 %	70-130	"	"	"
Surrogate: 4-Bromofluorobenzene	97.5 %	70-130	"	"	"

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LT Environmental, Inc.  
4600 West 60th Avenue

Arvada CO 80003

Project Number: MS1007

Project Name: WT Durham #4

MW09

5/3/2011 10:30:00AM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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Origins Laboratory, Inc.  
X105015-09 (Water)**BTEX by EPA 8260C**

Benzene	ND	1.0	ug/L	1	1E04004	05/04/2011	05/10/2011
Toluene	ND	1.0	"	"	"	"	"
Ethylbenzene	ND	1.0	"	"	"	"	"
Xylenes, total	ND	3.0	"	"	"	"	"

Surrogate: 1,2-Dichloroethane-d4	95.0 %	70-130	"	"	"
Surrogate: Toluene-d8	104 %	70-130	"	"	"
Surrogate: 4-Bromofluorobenzene	97.5 %	70-130	"	"	"

Origins Laboratory, Inc.



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

Project Number: MS1007  
Project Name: WT Durham #4

MW10

5/3/2011 10:40:00AM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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Origins Laboratory, Inc.  
X105015-10 (Water)

### BTEX by EPA 8260C

Benzene	ND	1.0	ug/L	1	1E04004	05/04/2011	05/10/2011
Toluene	ND	1.0	"	"	"	"	"
Ethylbenzene	ND	1.0	"	"	"	"	"
Xylenes, total	ND	3.0	"	"	"	"	"

Surrogate: 1,2-Dichloroethane-d4	94.5 %	70-130	"	"	"
Surrogate: Toluene-d8	105 %	70-130	"	"	"
Surrogate: 4-Bromofluorobenzene	97.4 %	70-130	"	"	"

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LT Environmental, Inc.  
4600 West 60th Avenue

Arvada CO 80003

Project Number: MS1007

Project Name: WT Durham #4

MW11

5/3/2011 10:50:00AM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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Origins Laboratory, Inc.  
X105015-11 (Water)

## BTEX by EPA 8260C

Benzene	ND	1.0	ug/L	1	1E04004	05/04/2011	05/10/2011
Toluene	ND	1.0	"	"	"	"	"
Ethylbenzene	ND	1.0	"	"	"	"	"
Xylenes, total	ND	3.0	"	"	"	"	"

Surrogate: 1,2-Dichloroethane-d4	95.0 %	70-130	"	"	"
Surrogate: Toluene-d8	106 %	70-130	"	"	"
Surrogate: 4-Bromofluorobenzene	96.2 %	70-130	"	"	"

## Metals by SW6010B

Iron	ND	200	ug/L	1	855557	05/10/2011	05/10/2011
Manganese	171	20	"	"	"	"	"

## Nitrate by EPA 300

Nitrate as N	ND	0.05	mg/L	1	855048	05/05/2011	05/05/2011
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## Sulfate by EPA 300

Sulfate	259	0.5	mg/L	1	855048	"	05/05/2011
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LT Environmental, Inc.  
4600 West 60th Avenue

Arvada CO 80003

Project Number: MS1007

Project Name: WT Durham #4

**Volatile Organic Compounds by GC/MS SW846 8260C - 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 1E04004 - EPA 5030B

Blank (1E04004-BLK1)

Prepared: 05/04/2011 Analyzed: 05/06/2011

Benzene	ND	1.0	ug/L							
Toluene	ND	1.0	"							
Ethylbenzene	ND	1.0	"							
m,p-Xylene	ND	2.0	"							
o-Xylene	ND	1.0	"							
Surrogate: 1,2-Dichloroethane-d4	59		"	62.5		95.1	70-130			
Surrogate: Toluene-d8	66		"	62.5		106	70-130			
Surrogate: 4-Bromofluorobenzene	64		"	62.5		102	70-130			

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LT Environmental, Inc.  
4600 West 60th Avenue

Arvada CO 80003

Project Number: MS1007

Project Name: WT Durham #4

Volatile Organic Compounds by GC/MS SW846 8260C - 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 1E04004 - EPA 5030B

Blank (1E04004-BLK2)

Prepared: 05/04/2011 Analyzed: 05/06/2011

Benzene	ND	1.0	ug/L
Toluene	ND	1.0	"
Ethylbenzene	ND	1.0	"
m,p-Xylene	ND	2.0	"
o-Xylene	ND	1.0	"

Surrogate: 1,2-Dichloroethane-d4	60	"	62.5	96.7	70-130
Surrogate: Toluene-d8	65	"	62.5	104	70-130
Surrogate: 4-Bromofluorobenzene	63	"	62.5	101	70-130

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LT Environmental, Inc.  
4600 West 60th Avenue

Arvada CO 80003

Project Number: MS1007

Project Name: WT Durham #4

Volatile Organic Compounds by GC/MS SW846 8260C - Quality Control  
Origins Laboratory, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1E04004 - EPA 5030B										
LCS (1E04004-BS1)					Prepared: 05/04/2011 Analyzed: 05/06/2011					
Benzene	49.4	1.0	ug/L	50.0		98.7	70-130			
Toluene	51.9	1.0	"	50.0		104	70-130			
Ethylbenzene	53.6	1.0	"	50.0		107	70-130			
m,p-Xylene	111	2.0	"	100		111	70-130			
o-Xylene	52.5	1.0	"	50.0		105	70-130			
Surrogate: 1,2-Dichloroethane-d4	56		"	62.5		89.6	70-130			
Surrogate: Toluene-d8	64		"	62.5		102	70-130			
Surrogate: 4-Bromofluorobenzene	60		"	62.5		96.6	70-130			

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LT Environmental, Inc.  
4600 West 60th Avenue

Arvada CO 80003

Project Number: MS1007

Project Name: WT Durham #4

Volatile Organic Compounds by GC/MS SW846 8260C - Quality Control  
Origins Laboratory, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1E04004 - EPA 5030B										
LCS (1E04004-BS2)					Prepared: 05/04/2011 Analyzed: 05/06/2011					
Benzene	48.8	1.0	ug/L	50.0		97.5	70-130			
Toluene	50.7	1.0	"	50.0		101	70-130			
Ethylbenzene	53.0	1.0	"	50.0		106	70-130			
m,p-Xylene	109	2.0	"	100		109	70-130			
o-Xylene	51.4	1.0	"	50.0		103	70-130			
Surrogate: 1,2-Dichloroethane-d4	56		"	62.5		88.8	70-130			
Surrogate: Toluene-d8	62		"	62.5		99.6	70-130			
Surrogate: 4-Bromofluorobenzene	61		"	62.5		96.9	70-130			

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Noelle E Doyle, President

LT Environmental, Inc.  
4600 West 60th Avenue

Arvada CO 80003

Project Number: MS1007

Project Name: WT Durham #4

Volatile Organic Compounds by GC/MS SW846 8260C - 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 1E04004 - EPA 5030B

Matrix Spike (1E04004-MS1)		Source: X105013-02			Prepared: 05/04/2011 Analyzed: 05/06/2011					
Benzene	49.4	1.0	ug/L	50.0	ND	98.7	70-130			
Toluene	50.0	1.0	"	50.0	ND	100	70-130			
Ethylbenzene	51.6	1.0	"	50.0	ND	103	70-130			
m,p-Xylene	103	2.0	"	100	ND	103	70-130			
o-Xylene	49.4	1.0	"	50.0	ND	98.8	70-130			
Surrogate: 1,2-Dichloroethane-d4	56		"	62.5		89.3	70-130			
Surrogate: Toluene-d8	62		"	62.5		98.9	70-130			
Surrogate: 4-Bromofluorobenzene	61		"	62.5		96.9	70-130			

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LT Environmental, Inc.  
4600 West 60th Avenue

Arvada CO 80003

Project Number: MS1007

Project Name: WT Durham #4

Volatile Organic Compounds by GC/MS SW846 8260C - 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 1E04004 - EPA 5030B

Matrix Spike (1E04004-MS2)		Source: X105014-01			Prepared: 05/04/2011 Analyzed: 05/06/2011					
Benzene	48.6	1.0	ug/L	50.0	ND	97.2	70-130			
Toluene	49.5	1.0	"	50.0	ND	99.0	70-130			
Ethylbenzene	50.9	1.0	"	50.0	ND	102	70-130			
m,p-Xylene	101	2.0	"	100	ND	101	70-130			
o-Xylene	49.0	1.0	"	50.0	ND	98.0	70-130			
Surrogate: 1,2-Dichloroethane-d4	56		"	62.5		90.1	70-130			
Surrogate: Toluene-d8	62		"	62.5		99.6	70-130			
Surrogate: 4-Bromofluorobenzene	60		"	62.5		96.1	70-130			

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LT Environmental, Inc.  
4600 West 60th Avenue

Arvada CO 80003

Project Number: MS1007

Project Name: WT Durham #4

Volatile Organic Compounds by GC/MS SW846 8260C - 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 1E04004 - EPA 5030B

Matrix Spike Dup (1E04004-MSD1)		Source: X105013-02			Prepared: 05/04/2011 Analyzed: 05/06/2011					
Benzene	49.4	1.0	ug/L	50.0	ND	98.9	70-130	0.162	20	
Toluene	48.0	1.0	"	50.0	ND	95.9	70-130	4.22	20	
Ethylbenzene	49.3	1.0	"	50.0	ND	98.6	70-130	4.46	20	
m,p-Xylene	89.1	2.0	"	100	ND	89.1	70-130	14.5	20	
o-Xylene	44.4	1.0	"	50.0	ND	88.9	70-130	10.5	20	
Surrogate: 1,2-Dichloroethane-d4	56		"	62.5		89.4	70-130			
Surrogate: Toluene-d8	61		"	62.5		97.5	70-130			
Surrogate: 4-Bromofluorobenzene	60		"	62.5		95.2	70-130			

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LT Environmental, Inc.  
4600 West 60th Avenue

Arvada CO 80003

Project Number: MS1007

Project Name: WT Durham #4

Volatile Organic Compounds by GC/MS SW846 8260C - 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 1E04004 - EPA 5030B

Matrix Spike Dup (1E04004-MSD2)		Source: X105014-01			Prepared: 05/04/2011 Analyzed: 05/06/2011					
Benzene	47.8	1.0	ug/L	50.0	ND	95.7	70-130	1.60	20	
Toluene	48.6	1.0	"	50.0	ND	97.3	70-130	1.75	20	
Ethylbenzene	50.4	1.0	"	50.0	ND	101	70-130	0.988	20	
m,p-Xylene	96.8	2.0	"	100	ND	96.8	70-130	4.06	20	
o-Xylene	47.7	1.0	"	50.0	ND	95.3	70-130	2.81	20	
Surrogate: 1,2-Dichloroethane-d4	56		"	62.5		89.9	70-130			
Surrogate: Toluene-d8	62		"	62.5		99.2	70-130			
Surrogate: 4-Bromofluorobenzene	59		"	62.5		95.1	70-130			

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LT Environmental, Inc.  
4600 West 60th Avenue

Arvada CO 80003

Project Number: MS1007

Project Name: WT Durham #4

**Volatile Organic Compounds by GC/MS SW846 8260C - 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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**Metals by SW6010B - Quality Control**  
**XENCO**

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch 855557 - SW3010A

<b>MS (415263-001 S)</b>		<b>Source: 415263-001 S</b>			<b>Prepared: 05/10/2011 Analyzed: 05/10/2011</b>					
Iron	7230	200	ug/L	5000	2780	89	75-125		20	
Manganese	1090	20	"	1000	180	91	75-125		20	
<b>MSD (415263-001 SD)</b>		<b>Source: 415263-001 SD</b>			<b>Prepared: 05/10/2011 Analyzed: 05/10/2011</b>					
Iron	6930	200	ug/L	5000	2780	83	75-125	4	20	
Manganese	1060	20	"	1000	180	88	75-125	3	20	
<b>LCS (602152-1-BKS)</b>		<b>Source: 602152-1-BKS</b>			<b>Prepared: 05/10/2011 Analyzed: 05/10/2011</b>					
Manganese	947	20	ug/L	1000	<6.40	95	75-125		20	
Iron	4870	200	"	5000	<32.0	97	75-125		20	
<b>BLANK (602152-1-BLK)</b>		<b>Source: 602152-1-BLK</b>			<b>Prepared: 05/10/2011 Analyzed: 05/10/2011</b>					
Iron	ND	200	ug/L	5000			-		20	
Manganese	ND	20	"	1000			-		20	

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Noelle E Doyle, President

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

Project Number: MS1007  
Project Name: WT Durham #4

**Nitrate by EPA 300 - Quality Control**  
**XENCO**

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 855048 - E300P										
MS (414785-002 S)		Source: 414785-002 S			Prepared: 05/05/2011 Analyzed: 05/05/2011					
Nitrate as N	2.12	0.05	mg/L	2.26	<0.00740	94	80-120		20	
LCS (602207-1-BKS)		Source: 602207-1-BKS			Prepared: 05/05/2011 Analyzed: 05/05/2011					
Nitrate as N	2.15	0.05	mg/L	2.26	<0.00740	95	80-120		20	
BLANK (602207-1-BLK)		Source: 602207-1-BLK			Prepared: 05/05/2011 Analyzed: 05/05/2011					
Nitrate as N	ND	0.05	mg/L	2.26			-		20	

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Project Name: WT Durham #4

**Sulfate by EPA 300 - Quality Control**  
**XENCO**

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 855048 - E300P										
MS (414785-002 S)		Source: 414785-002 S			Prepared: 05/05/2011 Analyzed: 05/05/2011					
Sulfate	49.9	0.5	mg/L	50	<0.0755	100	80-120		20	
LCS (602207-1-BKS)		Source: 602207-1-BKS			Prepared: 05/05/2011 Analyzed: 05/05/2011					
Sulfate	49.6	0.5	mg/L	50	<0.0755	99	80-120		20	
BLANK (602207-1-BLK)		Source: 602207-1-BLK			Prepared: 05/05/2011 Analyzed: 05/05/2011					
Sulfate	ND	0.5	mg/L	50			-		20	

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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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