

November 29, 2018

Mr. Greg Hamilton  
Senior Staff HSE Representative  
Kerr-McGee Oil & Gas Onshore LP  
1099 18th Street, Suite 1800  
Denver, Colorado 80202

**RE: Sump Closure Report  
Watada Red WW 19-4D  
API # 05-123-16643  
Location ID # 328935  
Remediation # 12132  
NWSE Sec 19-T1N-R66W  
Weld County, Colorado**

Dear Mr. Hamilton:

LT Environmental, Inc. (LTE) was contracted by Kerr-McGee Oil & Gas Onshore LP (Kerr-McGee) to conduct environmental oversight activities at the above-referenced site. The oversight activities included documenting field activities, collecting soil samples, and reviewing laboratory analytical results.

The objective of the soil sampling was to determine if petroleum hydrocarbon impact to subsurface soil is present as a result of operating a produced water sump at the site. The soil sampling activities, laboratory analytical results, and conclusions are summarized below. The general site layout, soil sample location, and sump excavation dimensions are depicted on the Excavation Site Map provided as Figure 1.

On July 3, 2018, following removal of the produced water sump, soil samples were collected from the sidewalls and base of the excavation. The soil samples were field-screened for volatile organic compounds using a photoionization detector (PID). Soil staining and/or odor were not observed. The highest PID headspace reading recorded was 95.1 parts per million for the base soil sample. Based on field screening results, the excavation base soil sample (B01@6') was submitted for laboratory analysis of benzene, toluene, ethylbenzene, and total xylenes (BTEX) and total petroleum hydrocarbons (TPH)-gasoline range organics (GRO) by United States Environmental Protection Agency (USEPA) Method 8260C, TPH-diesel range organics (DRO) and oil range organics (ORO) by USEPA Method 8015C, pH by USEPA Method 9045D, and specific conductance (EC) by USEPA Method 9050A. Laboratory analytical results for soil sample B01@6' indicated that BTEX, TPH, pH, and EC concentrations and levels were in full compliance with COGCC Table 910-1



allowable levels. The soil sample analytical results are summarized in Table 1, and the laboratory analytical report is attached.

The sump excavation extent measured approximately 13 feet north to south by 19 feet east to west to an approximate depth of 6 feet below ground surface. Groundwater and impacted soil were not encountered in the excavation. A liner was not present beneath the sump at this site. The produced water sump at this facility has been permanently removed. The excavation area was backfilled and contoured to match pre-existing site conditions.

LTE appreciates the opportunity to provide environmental services to Kerr-McGee. Please contact LTE at (303) 433-9788 if you have any questions regarding this Sump Closure Report or if you require additional information.

Sincerely,

LT ENVIRONMENTAL, INC.

A handwritten signature in blue ink, appearing to read 'Daniel Thomas'.

Daniel Thomas, GIT  
Staff Geologist

A handwritten signature in blue ink, appearing to read 'Brian Sulzberger'.

Brian Sulzberger, P.E., P.G.  
Senior Engineer

Attachments



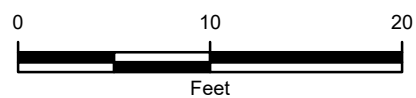




# LEGEND

- SOIL SAMPLE
  - M METER HOUSE
  - EXCAVATION EXTENT
  - FORMER BERM
- AST: ABOVEGROUND STORAGE TANK

IMAGE COURTESY OF GOOGLE EARTH 2017



**FIGURE 1**  
**EXCAVATION SITE MAP**  
 WATADA RED WW 19-4D  
 NWSE SEC 19-T1N-R66W  
 WELD COUNTY, COLORADO  
 KERR-MCGEE OIL & GAS ONSHORE LP



**TABLE 1**  
**SOIL SAMPLE ANALYTICAL RESULTS**  
**WATADA RED WW 19-4D**  
**WELD COUNTY, COLORADO**  
**KERR-MCGEE OIL & GAS ONSHORE LP**

Soil Sample ID	Depth (bgs)	Date	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Total Xylenes (mg/kg)	DRO (mg/kg)	GRO (mg/kg)	ORO (mg/kg)	pH (su)	Specific Conductance (mmhos/cm)
B01@6'	6'	07/03/2018	<0.002	<0.002	<0.002	<0.002	251	<0.200	127	8.49	0.122
<b>COGCC Allowable Levels</b>			<b>0.17</b>	<b>85</b>	<b>100</b>	<b>175</b>	<b>500*</b>	<b>500*</b>	<b>500*</b>	<b>6-9</b>	<b>4</b>

Notes: bgs - below ground surface

COGCC - Colorado Oil and Gas Conservation Commission

DRO - diesel range organics

GRO - gasoline range organics

mg/kg - milligrams per kilogram

mmhos/cm - millimhos per centimeter

NA - not analyzed/not available

ORO - oil range organics

su - standard units

\* - Standard applies to combined DRO-GRO-ORO

< - less than laboratory reporting limit

Bold indicates result exceeds allowable level





October 24, 2018

LT Environmental, Inc.

Brian Sulzberger

4600 West 60th Avenue

Arvada

CO 80003

**Project Name - KMG - Watada Red WW 19-4D**

**Project Number - 014218142**

Attached are your analytical results for KMG - Watada Red WW 19-4D received by Origins Laboratory, Inc. July 03, 2018. This project is associated with Origins project number Y807059-01.

The analytical results in the following report were analyzed under the guidelines of EPA Methods. These methods are identified as follows; "SW" are defined in SW-846, "EPA" are defined in 40CFR part 136 and "SM" are defined in the most current revision of Standard Methods For the Examination of Water and Wastewater.

The analytical results apply specifically to the samples and analyses specified per the attached Chain of Custody. As such, this report shall not be reproduced except in full, without the written approval of Origin's laboratory.

Unless otherwise noted, the analytical results for all soil samples are reported on a wet weight basis. All analytical analyses were performed under NELAP guidelines unless noted by a data qualifier.

Any holding time exceedances, deviations from the method specifications or deviations from Origins Laboratory's Standard Operating Procedures are outlined in the case narrative.

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



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

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

Brian Sulzberger  
Project Number: 014218142  
Project: KMG - Watada Red WW 19-4D

### CROSS REFERENCE REPORT

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
B01@6'	Y807059-01	Soil	July 3, 2018 14:22	07/03/2018 16:30

Per the email from Daniel on 10/24/18, the project name was changed to Watada Red WW 19-4D.

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.*

Jen Pellegrini For Noelle Doyle Mathis, President

Brian Sulzberger  
Project Number: 014218142  
Project: KMG - Watada Red WW 19-4D

# ORIGINS

LABORATORY, INC

www.originslaboratory.com

page | of |

Client: LT Environmental

Address: 4600 N 60th Ave

Project Manager: Brian Sulzberger

Project Name: Watanda Red W/M 19-14D

Project Number: 014219142

Samples Collected By: Glenn Thompson

Telephone Number: 303 433 9785

Email Address: KMG TEAM

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	GTEX	Pb/TM Diox/Geo	
B01e6'	7/3/18	1422	2	X					X		X	X	X	Hold SAR
N01e4'		1427	2	X					X		X	X	X	Hold
E01e4'		1432	2	X					X		X	X	X	
S01e4'		1435	2	X					X		X	X	X	
W01e4'		1438	2	X					X		X	X	X	
B601		1440	2	X					X		X	X	X	
Relinquished By:	Date: 7/3/18	Time:	Received By:	Date:	Time:	Turnaround Time:								
Relinquished By:	Date:	Time:	Received By:	Date: 7/3/18	Time: 1630	Same Day <input checked="" type="checkbox"/> 24 Hr <input type="checkbox"/>								
						48 Hr <input type="checkbox"/> Standard <input type="checkbox"/> 72 Hr <input type="checkbox"/>								

Temp Received: 15.6

Date Results Needed

Origins Laboratory, Inc.

Jeff Pellipini

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

Brian Sulzberger  
Project Number: 014218142  
Project: KMG - Watada Red WW 19-4D

Origins Laboratory

F-012207-01-R1  
Effective Date: 01/09/12

## Sample Receipt Checklist

Origins Work Order: 1807059

Client: LTE

Client Project ID: KMG - Watada Red WW 19-4D

Checklist Completed by: JG

Shipped Via: HD  
(UPS, FedEx, Hand Delivered, Pick-up, etc.)

Date/time completed: 7/3/2018

Airbill #: N/A

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

Cooler Number/Temperature: 1 / 15.6 °C \_\_\_\_\_ / \_\_\_\_\_ °C \_\_\_\_\_ / \_\_\_\_\_ °C

Thermometer ID: T003

Requirement Description	Yes	No	N/A	Comments (if any)
If samples require cooling, was the temperature between 0°C to ≤ 6°C <sup>(1)</sup> ?		<input checked="" type="checkbox"/>		Same Day
Is there ice present (document if blue ice is used)	<input checked="" type="checkbox"/>			
Are custody seals present on cooler? (if so, document in comments if they are signed and dated, broken or intact)		<input checked="" type="checkbox"/>		
Are custody seals present on each sample container? (if so, document in comments if they are signed and dated, broken or intact)		<input checked="" type="checkbox"/>		
Were all samples received intact <sup>(1)</sup> ?	<input checked="" type="checkbox"/>			
Was adequate sample volume provided <sup>(1)</sup> ?	<input checked="" type="checkbox"/>			
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 (> ¼ inch bubble) present? If yes, contact client and note in narrative.			<input checked="" type="checkbox"/>	
Are samples preserved that require preservation and was it checked <sup>(1)</sup> ? (note ID of confirmation instrument used in comments) / (preservation is not confirmed for subcontracted analyses in order to insure sample integrity) (pH < 2 for samples preserved with HNO <sub>3</sub> , HCL, H <sub>2</sub> SO <sub>4</sub> ) / (pH > 10 for samples preserved with NaAsO <sub>2</sub> +NaOH, ZnAc+NaOH)		<input checked="" type="checkbox"/>		
Additional Comments (if any):				

<sup>(1)</sup> If NO, then contact the client before proceeding with analysis and note date/time and person contacted as well as the corrective action to in the additional comments (above) and the case narrative.

Reviewed by (Project Manager)

7/3/18  
Date/Time Reviewed

Origins Laboratory, Inc.

*Jefe Pellegrini*

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

Brian Sulzberger  
Project Number: 014218142  
Project: KMG - Watada Red WW 19-4D

B01@6'

7/3/2018 2:22:00PM

Analyte	Result	Limit	Units	Dilution	Batch	Analyst	Prepared	Analyzed	Notes
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**Origins Laboratory, Inc.**  
**Y807059-01 (Soil)**

**DRO/RRO by EPA8015C**

Diesel (C10-C28)	251	25.0	mg/kg	1	B8G0302	ZZZ	07/03/2018	07/03/2018	
Residual Range Organics (C28-C40)	127	100	"	"	"	ZZZ	"	"	

Surrogate: o-Terphenyl	93.9 %	59-131			"	"	"		
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**GBTEX by EPA 8260C**

Gasoline Range Hydrocarbons	ND	0.200	mg/kg	1	B8G0303	ZZZ	07/03/2018	07/03/2018	U
Benzene	ND	0.002	"	"	"	ZZZ	"	"	U
Toluene	ND	0.002	"	"	"	ZZZ	"	"	U
Ethylbenzene	ND	0.002	"	"	"	ZZZ	"	"	U
Xylenes, total	ND	0.002	"	"	"	ZZZ	"	"	U

Surrogate: 1,2-Dichloroethane-d4	97.7 %	70-130			"	"	"		
Surrogate: Toluene-d8	98.4 %	70-130			"	"	"		
Surrogate: 4-Bromofluorobenzene	101 %	70-130			"	"	"		

**pH in Soil by EPA 9045D**

pH	8.49		pH Units	1	B8G0307	KDK	07/03/2018	07/03/2018	
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**Specific Conductance by Modified 9050A**

Specific Conductance (EC)	0.122		mmhos/cm	"	B8G0308	KDK	"	07/03/2018	
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Origins Laboratory, Inc.



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

Brian Sulzberger  
Project Number: 014218142  
Project: KMG - Watada Red WW 19-4D

**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
<b>Batch B8G0303 - EPA 5030 (soil)</b>										
<b>Blank (B8G0303-BLK1)</b>					Prepared: 07/03/2018 Analyzed: 07/03/2018					
Gasoline Range Hydrocarbons	ND	0.200	mg/kg							U
Benzene	ND	0.002	"							U
Toluene	ND	0.002	"							U
Ethylbenzene	ND	0.002	"							U
Xylenes, total	ND	0.002	"							U
Surrogate: 1,2-Dichloroethane-d4	62		ug/kg	62.5		99.4	70-130			
Surrogate: Toluene-d8	61		"	62.5		98.1	70-130			
Surrogate: 4-Bromofluorobenzene	62		"	62.5		98.5	70-130			

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Brian Sulzberger  
Project Number: 014218142  
Project: KMG - Watada Red WW 19-4D

**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 B8G0303 - EPA 5030 (soil)										
LCS (B8G0303-BS1)					Prepared: 07/03/2018 Analyzed: 07/03/2018					
Benzene	0.106	0.002	mg/kg	0.100		106	77.1-124			
Toluene	0.100	0.002	"	0.100		100	74.5-128			
Ethylbenzene	0.096	0.002	"	0.100		95.5	66.4-127			
m,p-Xylene	0.194	0.004	"	0.200		97.0	76.6-124			
o-Xylene	0.107	0.002	"	0.100		107	76.6-124			
Surrogate: 1,2-Dichloroethane-d4	58		ug/kg	62.5		92.3	70-130			
Surrogate: Toluene-d8	61		"	62.5		98.1	70-130			
Surrogate: 4-Bromofluorobenzene	61		"	62.5		97.4	70-130			

Origins Laboratory, Inc.



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Project: KMG - Watada Red WW 19-4D

**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 B8G0303 - EPA 5030 (soil)

Matrix Spike (B8G0303-MS1)		Source: Y807026-04			Prepared: 07/03/2018 Analyzed: 07/03/2018					
Benzene	0.108	0.002	mg/kg	0.100	ND	108	71.8-126			
Toluene	0.101	0.002	"	0.100	ND	101	65.1-130			
Ethylbenzene	0.097	0.002	"	0.100	ND	96.7	62.2-130			
m,p-Xylene	0.197	0.004	"	0.200	ND	98.6	46.5-137			
o-Xylene	0.108	0.002	"	0.100	ND	108	54.2-134			
Surrogate: 1,2-Dichloroethane-d4	59		ug/kg	62.5		93.9	70-130			
Surrogate: Toluene-d8	61		"	62.5		97.3	70-130			
Surrogate: 4-Bromofluorobenzene	62		"	62.5		98.8	70-130			

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Arvada CO 80003

Brian Sulzberger  
Project Number: 014218142  
Project: KMG - Watada Red WW 19-4D

**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 B8G0303 - EPA 5030 (soil)

Matrix Spike Dup (B8G0303-MSD1)		Source: Y807026-04			Prepared: 07/03/2018 Analyzed: 07/03/2018					
Benzene	0.106	0.002	mg/kg	0.100	ND	106	71.8-126	1.18	11.3	
Toluene	0.101	0.002	"	0.100	ND	101	65.1-130	0.198	15.4	
Ethylbenzene	0.096	0.002	"	0.100	ND	95.9	62.2-130	0.789	19.6	
m,p-Xylene	0.197	0.004	"	0.200	ND	98.7	46.5-137	0.142	19.2	
o-Xylene	0.108	0.002	"	0.100	ND	108	54.2-134	0.870	17.9	
Surrogate: 1,2-Dichloroethane-d4	58		ug/kg	62.5		93.1	70-130			
Surrogate: Toluene-d8	62		"	62.5		98.5	70-130			
Surrogate: 4-Bromofluorobenzene	62		"	62.5		98.8	70-130			

Origins Laboratory, Inc.



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

Brian Sulzberger  
Project Number: 014218142  
Project: KMG - Watada Red WW 19-4D

**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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**Extractable Petroleum Hydrocarbons by 8015C - 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 B8G0302 - EPA 3550B**

**Blank (B8G0302-BLK1)**

Prepared: 07/03/2018 Analyzed: 07/03/2018

Diesel (C10-C28)	ND	50.0	mg/kg							U
Residual Range Organics (C28-C40)	ND	200	"							U
Surrogate: o-Terphenyl	45		"	50.0		90.1	59-131			

**LCS (B8G0302-BS1)**

Prepared: 07/03/2018 Analyzed: 07/03/2018

Diesel (C10-C28)	1100	50.0	mg/kg	1000		110	64-121			
Residual Range Organics (C28-C40)	1150	200	"	1000		115	58-124			
Surrogate: o-Terphenyl	55		"	50.0		111	59-131			

**Matrix Spike (B8G0302-MS1)**

**Source: Y807044-01**

Prepared: 07/03/2018 Analyzed: 07/03/2018

Diesel (C10-C28)	1050	50.0	mg/kg	1000	17.0	103	53-125			
Residual Range Organics (C28-C40)	1130	200	"	1000	17.7	112	47-133			
Surrogate: o-Terphenyl	51		"	50.0		103	59-131			

**Matrix Spike Dup (B8G0302-MSD1)**

**Source: Y807044-01**

Prepared: 07/03/2018 Analyzed: 07/03/2018

Diesel (C10-C28)	1060	50.0	mg/kg	1000	17.0	104	53-125	1.53	20	
Residual Range Organics (C28-C40)	1130	200	"	1000	17.7	111	47-133	0.705	20	
Surrogate: o-Terphenyl	53		"	50.0		105	59-131			

Origins Laboratory, Inc.



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4600 West 60th Avenue  
Arvada CO 80003

Brian Sulzberger  
Project Number: 014218142  
Project: KMG - Watada Red WW 19-4D

## Classical Chemistry Parameters - Quality Control Origins Laboratory, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Batch B8G0307 - NO PREP</b>										
<b>Duplicate (B8G0307-DUP1)</b>		<b>Source: Y807058-01</b>			Prepared: 07/03/2018 Analyzed: 07/03/2018					
pH	8.59		pH Units		8.69			1.16	25	
<b>Batch B8G0308 - NO PREP</b>										
<b>Blank (B8G0308-BLK1)</b>		Prepared: 07/03/2018 Analyzed: 07/03/2018								
Specific Conductance (EC)	0.00240		mmhos/cm							
<b>Duplicate (B8G0308-DUP1)</b>		<b>Source: Y807058-01</b>			Prepared: 07/03/2018 Analyzed: 07/03/2018					
Specific Conductance (EC)	0.0774		mmhos/cm		0.0636			19.6	25	

Origins Laboratory, Inc.



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

Brian Sulzberger  
Project Number: 014218142  
Project: KMG - Watada Red WW 19-4D

### Notes and Definitions

U Sample is Non-Detect.

ND Analyte NOT DETECTED at or above the reporting limit

RPD Relative Percent Difference

All soil results are reported at a wet weight basis.

Origins Laboratory, Inc.



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