

November 21, 2017

Mr. Phil Hamlin, REM, CSEM
Senior HSE Representative
Kerr-McGee Oil & Gas Onshore LP
1099 18th Street, Suite 1800
Denver, Colorado 80202

**RE: Sump Closure Report
Wright 31-21
API# 05-123-24037
Location ID # 306136
Remediation # 10713
NWNE Sec 21-T1N-R67W
Weld County, Colorado**

Dear Mr. Hamlin:

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 resulted from Kerr-McGee 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 May 11, 2017, 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, odor, and/or elevated headspace readings were not observed or identified through PID screening; the highest PID reading recorded was 1.5 parts per million. Based on field screening results, the excavation base soil sample (B01@5') 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@5' indicated that BTEX, TPH, pH, and EC concentrations and levels were compliant 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 30 feet north to south by 20 feet east to west to an approximate depth of 5 feet bgs. 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 that reads 'Katharine Howe'. The signature is written in a cursive, flowing style.

Katharine Howe, E.I.
Staff Engineer

Reviewed by

A handwritten signature in blue ink that reads 'Brian Sulzberger'. The signature is written in a cursive, flowing style.

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

Attachments



ATTACHMENTS



TABLE 1
SOIL SAMPLE ANALYTICAL RESULTS
WRIGHT 31-21
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@5'	5'	05/11/2017	<0.002	<0.002	<0.002	<0.002	<25.0	<0.200	<100	7.89	0.468
COGCC Allowable Levels			0.17	85	100	175	500*	500*	500*	6-9	4

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

TPH - total petroleum hydrocarbons

* - TPH standard applies to combined DRO-GRO-ORO

< - less than laboratory reporting limit

Bold indicates result exceeds allowable level.





May 12, 2017

LT Environmental, Inc.

Brian Sulzberger

4600 West 60th Avenue

Arvada CO 80003

Project Name - KMG - Wright 31-21

Project Number - 014217102

Attached are your analytical results for KMG - Wright 31-21 received by Origins Laboratory, Inc. May 11, 2017. This project is associated with Origins project number Y705164-01.

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: 014217102
Project: KMG - Wright 31-21

CROSS REFERENCE REPORT

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
B01@5'	Y705164-01	Soil	May 11, 2017 15:50	05/11/2017 17:48

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

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

Brian Sulzberger
 Project Number: 014217102
 Project: KMG - Wright 31-21

Origins Laboratory

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

Sample Receipt Checklist

Origins Work Order: 1705164 Client: LFE
 Client Project ID: KMG - Wright 31-21
 Checklist Completed by: Don W Shipped Via: FED
 (UPS, FedEx, Hand Delivered, Pick-up, etc.)
 Date/time completed: 5-11-12 1758 Airbill #: NA
 Matrix(s) Received: (Check all that apply): Soil/Solid Water Other: _____ (Describe)
 Cooler Number/Temperature: 1 / 56 °C 1 °C 1 °C 1 °C
 Thermometer ID: 1603

Requirement Description	Yes	No	N/A	Comments (if any)
If samples require cooling, was the temperature between 0°C to ≤ 6°C ⁽¹⁾ ?	<input checked="" type="checkbox"/>			
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 ⁽¹⁾ ?	<input checked="" type="checkbox"/>			
Was adequate sample volume provided ⁽¹⁾ ?	<input checked="" type="checkbox"/>			
Are short holding time analytes or samples with HTs due within 48 hours present ⁽¹⁾ ?	<input checked="" type="checkbox"/>			pH
Is a chain-of-custody (COC) present and filled out completely ⁽¹⁾ ?	<input checked="" type="checkbox"/>			
Does the COC agree with the number and type of sample bottles received ⁽¹⁾ ?	<input checked="" type="checkbox"/>			
Do the sample IDs on the bottle labels match the COC ⁽¹⁾ ?	<input checked="" type="checkbox"/>			
Is the COC properly relinquished by the client with date and time recorded ⁽¹⁾ ?	<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 ⁽¹⁾ ? (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 ₃ , HCL, H ₂ SO ₄) / (pH >10 for samples preserved with NaAsO ₂ +NaOH, ZnAc+NaOH)		<input checked="" type="checkbox"/>		
Additional Comments (if any):				

⁽¹⁾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) [Signature]

Date/Time Reviewed 5-11-12 1759

Origins Laboratory, Inc.

Jefe Pellegrini

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

Brian Sulzberger
 Project Number: 014217102
 Project: KMG - Wright 31-21

B01@5'
5/11/2017 3:50:00PM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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Origins Laboratory, Inc.
Y705164-01 (Soil)

DRO/RRO by EPA8015C

Diesel (C10-C28)	ND	25.0	mg/kg	1	B7E1103	05/11/2017	05/11/2017	U
Residual Range Organics (C28-C40)	ND	100	"	"	"	"	"	U

Surrogate: o-Terphenyl 79.3 % 59-131 " " "

GBTEX by EPA 8260C

Gasoline Range Hydrocarbons	ND	0.200	mg/kg	1	B7E1102	05/11/2017	05/11/2017	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 116 % 70-130 " " "
Surrogate: Toluene-d8 94.2 % 70-130 " " "
Surrogate: 4-Bromofluorobenzene 101 % 70-130 " " "

pH in Soil by EPA 9045D

pH	7.89		pH Units	1	B7E1104	05/11/2017	05/11/2017	
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Specific Conductance by Modified 9050A

Specific Conductance (EC)	0.468		mmhos/cm	"	B7E1105	05/11/2017	05/11/2017	
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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: 014217102
 Project: KMG - Wright 31-21

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 B7E1102 - EPA 5030 (soil)										
Blank (B7E1102-BLK1)										
Prepared: 05/11/2017 Analyzed: 05/11/2017										
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	65		ug/kg	62.5		104	70-130			
Surrogate: Toluene-d8	62		"	62.5		98.6	70-130			
Surrogate: 4-Bromofluorobenzene	60		"	62.5		96.3	70-130			

Origins Laboratory, Inc.



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

Brian Sulzberger
 Project Number: 014217102
 Project: KMG - Wright 31-21

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 B7E1102 - EPA 5030 (soil)

LCS (B7E1102-BS1)

Prepared: 05/11/2017 Analyzed: 05/11/2017

Benzene	0.102	0.002	mg/kg	0.100		102	77.1-124			
Toluene	0.102	0.002	"	0.100		102	74.5-128			
Ethylbenzene	0.101	0.002	"	0.100		101	66.4-127			
m,p-Xylene	0.201	0.004	"	0.200		101	76.6-124			
o-Xylene	0.102	0.002	"	0.100		102	76.6-124			
Surrogate: 1,2-Dichloroethane-d4	62		ug/kg	62.5		98.8	70-130			
Surrogate: Toluene-d8	62		"	62.5		99.2	70-130			
Surrogate: 4-Bromofluorobenzene	62		"	62.5		99.1	70-130			

Origins Laboratory, Inc.



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LT Environmental, Inc.
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 Arvada CO 80003

Brian Sulzberger
 Project Number: 014217102
 Project: KMG - Wright 31-21

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 B7E1102 - EPA 5030 (soil)

Matrix Spike (B7E1102-MS1)	Source: Y705150-01			Prepared: 05/11/2017 Analyzed: 05/11/2017						
Benzene	0.078	0.002	mg/kg	0.100	ND	77.8	71.8-126			
Toluene	0.073	0.002	"	0.100	ND	73.1	65.1-130			
Ethylbenzene	0.071	0.002	"	0.100	ND	71.4	62.2-130			
m,p-Xylene	0.141	0.004	"	0.200	ND	70.6	46.5-137			
o-Xylene	0.073	0.002	"	0.100	ND	73.0	54.2-134			
Surrogate: 1,2-Dichloroethane-d4	65		ug/kg	62.5		105	70-130			
Surrogate: Toluene-d8	62		"	62.5		98.7	70-130			
Surrogate: 4-Bromofluorobenzene	64		"	62.5		103	70-130			

Origins Laboratory, Inc.



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 Arvada CO 80003

Brian Sulzberger
 Project Number: 014217102
 Project: KMG - Wright 31-21

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 B7E1102 - EPA 5030 (soil)

Matrix Spike Dup (B7E1102-MSD1)	Source: Y705150-01			Prepared: 05/11/2017 Analyzed: 05/11/2017						
Benzene	0.087	0.002	mg/kg	0.100	ND	87.4	71.8-126	11.6	11.3	QR-02
Toluene	0.083	0.002	"	0.100	ND	83.1	65.1-130	12.9	15.4	
Ethylbenzene	0.079	0.002	"	0.100	ND	78.6	62.2-130	9.55	19.6	
m,p-Xylene	0.157	0.004	"	0.200	ND	78.4	46.5-137	10.4	19.2	
o-Xylene	0.082	0.002	"	0.100	ND	81.6	54.2-134	11.1	17.9	
Surrogate: 1,2-Dichloroethane-d4	64		ug/kg	62.5		103	70-130			
Surrogate: Toluene-d8	62		"	62.5		99.2	70-130			
Surrogate: 4-Bromofluorobenzene	62		"	62.5		99.3	70-130			

Origins Laboratory, Inc.



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

Brian Sulzberger
 Project Number: 014217102
 Project: KMG - Wright 31-21

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 B7E1103 - EPA 3580

Blank (B7E1103-BLK1)

Prepared: 05/11/2017 Analyzed: 05/11/2017

Diesel (C10-C28)	ND	50.0	mg/kg							U
Residual Range Organics (C28-C40)	ND	200	"							U
Surrogate: o-Terphenyl	40		"	50.0		79.3	59-131			

Blank (B7E1103-BLK2)

Prepared: 05/11/2017 Analyzed: 05/11/2017

Diesel (C10-C28)	ND	50.0	mg/kg							U
Residual Range Organics (C28-C40)	ND	200	"							U
Surrogate: o-Terphenyl	45		"	50.0		90.2	59-131			

LCS (B7E1103-BS1)

Prepared: 05/11/2017 Analyzed: 05/11/2017

Diesel (C10-C28)	1060	50.0	mg/kg	1000		106	64-121			
Residual Range Organics (C28-C40)	1020	200	"	1000		102	58-124			
Surrogate: o-Terphenyl	47		"	50.0		94.1	59-131			

LCS (B7E1103-BS2)

Prepared: 05/11/2017 Analyzed: 05/12/2017

Diesel (C10-C28)	1080	50.0	mg/kg	1000		108	64-121			
Residual Range Organics (C28-C40)	1050	200	"	1000		105	58-124			
Surrogate: o-Terphenyl	47		"	50.0		93.2	59-131			

Matrix Spike (B7E1103-MS1)

Source: Y705156-01

Prepared: 05/11/2017 Analyzed: 05/11/2017

Diesel (C10-C28)	1010	50.0	mg/kg	1000	17.1	99.5	53-125			
Residual Range Organics (C28-C40)	965	200	"	1000	18.6	94.7	47-133			

Origins Laboratory, Inc.



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

Brian Sulzberger
 Project Number: 014217102
 Project: KMG - Wright 31-21

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
Batch B7E1103 - EPA 3580										
Matrix Spike (B7E1103-MS1)			Source: Y705156-01		Prepared: 05/11/2017 Analyzed: 05/11/2017					
Surrogate: o-Terphenyl	43		mg/kg	50.0		85.9	59-131			
Matrix Spike (B7E1103-MS2)			Source: Y705156-02		Prepared: 05/11/2017 Analyzed: 05/12/2017					
Diesel (C10-C28)	1070	50.0	mg/kg	1000	19.8	105	53-125			
Residual Range Organics (C28-C40)	1010	200	"	1000	32.2	98.2	47-133			
Surrogate: o-Terphenyl	45		"	50.0		89.8	59-131			
Matrix Spike Dup (B7E1103-MSD1)			Source: Y705156-01		Prepared: 05/11/2017 Analyzed: 05/11/2017					
Diesel (C10-C28)	1020	50.0	mg/kg	1000	17.1	100	53-125	0.725	20	
Residual Range Organics (C28-C40)	972	200	"	1000	18.6	95.4	47-133	0.748	20	
Surrogate: o-Terphenyl	47		"	50.0		93.3	59-131			
Matrix Spike Dup (B7E1103-MSD2)			Source: Y705156-02		Prepared: 05/11/2017 Analyzed: 05/12/2017					
Diesel (C10-C28)	832	50.0	mg/kg	1000	19.8	81.2	53-125	25.2	20	QR-02
Residual Range Organics (C28-C40)	756	200	"	1000	32.2	72.4	47-133	30.2	20	QR-02
Surrogate: o-Terphenyl	34		"	50.0		68.8	59-131			

Origins Laboratory, Inc.



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

Brian Sulzberger
 Project Number: 014217102
 Project: KMG - Wright 31-21

Classical Chemistry Parameters - Quality Control
Origins Laboratory, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B7E1104 - NO PREP										
Duplicate (B7E1104-DUP1)		Source: Y705157-01			Prepared: 05/11/2017 Analyzed: 05/11/2017					
pH	8.89		pH Units		8.98			1.01	25	
Batch B7E1105 - NO PREP										
Blank (B7E1105-BLK1)		Prepared: 05/11/2017 Analyzed: 05/11/2017								
Specific Conductance (EC)	0.00320		mmhos/cm							
Duplicate (B7E1105-DUP1)		Source: Y705157-01			Prepared: 05/11/2017 Analyzed: 05/11/2017					
Specific Conductance (EC)	0.0827		mmhos/cm		0.0817			1.22	25	

Origins Laboratory, Inc.



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

Brian Sulzberger
Project Number: 014217102
Project: KMG - Wright 31-21

Notes and Definitions

U Sample is Non-Detect.

QR-02 The RPD result exceeded the QC control limits; however, both percent recoveries were acceptable. Sample results for the QC batch were accepted based on percent recoveries and completeness of QC data.

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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Jen Pellegrini For Noelle Doyle Mathis, President