

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
Amato 12-1, 22-1
API # 05-123-23949, 05-123-22916
Location ID # 305399
Remediation # 12132
SWNW Sec 1-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 September 12, 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 total 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 3.4 parts per million. 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 Colorado Oil and Gas Conservation Commission 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 18 feet north to south by 22 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 black ink, appearing to read 'Alex Guy', written over a light blue rectangular background.

Alexandra Guy
Staff Environmental Scientist

A handwritten signature in black ink, appearing to read 'Brian Sulzberger', written over a light blue rectangular background.

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

Attachments





ATTACHMENTS

AGRICULTURE

ACCESS ROAD

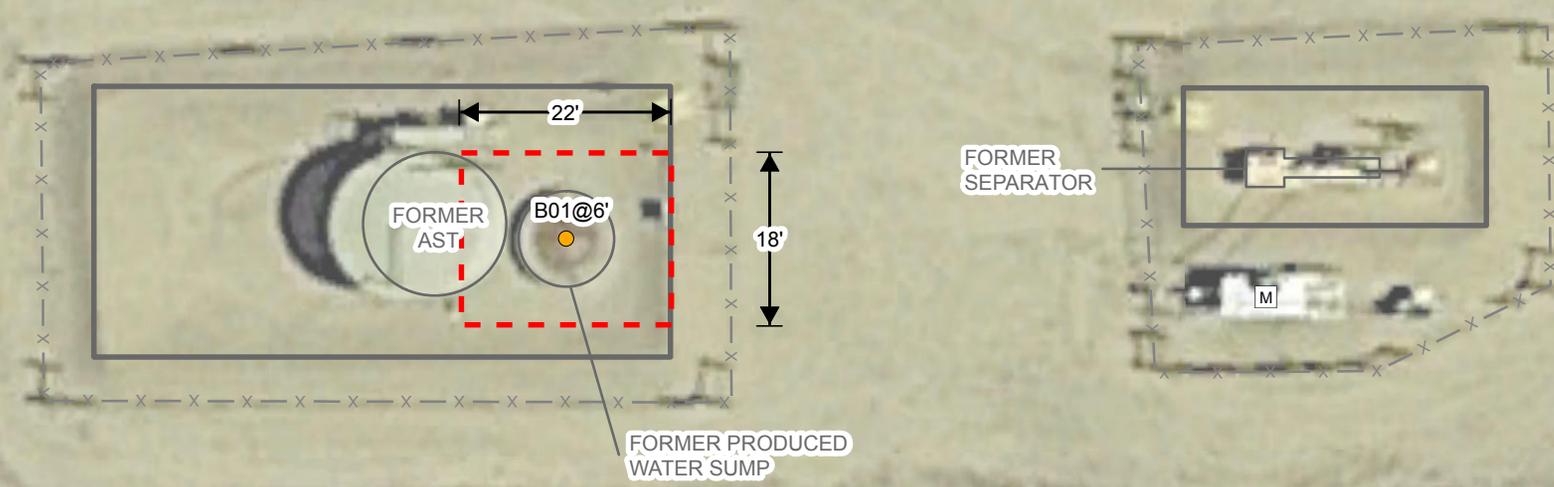


IMAGE COURTESY OF GOOGLE EARTH 2018

LEGEND

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

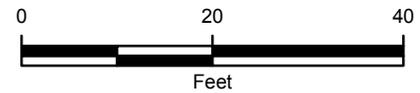


FIGURE 1
EXCAVATION SITE MAP
 AMATO 12-1, 22-1
 SWNW SEC 1-T1N-R66W
 WELD COUNTY, COLORADO
 KERR-MCGEE OIL & GAS ONSHORE LP



TABLE 1
SOIL SAMPLE ANALYTICAL RESULTS
AMATO 12-1, 22-1
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'	09/12/2018	<0.002	<0.002	<0.002	<0.002	<25.0	<0.200	<100	6.46	0.0790
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
* - Standard applies to combined DRO-GRO-ORO
< - less than laboratory reporting limit
Bold indicates result exceeds allowable level





September 13, 2018

LT Environmental, Inc.

Brian Sulzberger

4600 West 60th Avenue

Arvada CO 80003

Project Name - KMG - Amato 12-1, 22-1

Project Number - 014218190

Attached are your analytical results for KMG - Amato 12-1, 22-1 received by Origins Laboratory, Inc. September 12, 2018. This project is associated with Origins project number Y809133-01.

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: 014218190
Project: KMG - Amato 12-1, 22-1

CROSS REFERENCE REPORT

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
B01@6'	Y809133-01	Soil	September 12, 2018 11:10	09/12/2018 16:00

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.

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

Brian Sulzberger
 Project Number: 014218190
 Project: KMG - Amato 12-1, 22-1

Origins Laboratory

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

Sample Receipt Checklist

Origins Work Order: 4809133 Client: LTE
 Checklist Completed by: [Signature] Client Project ID: KMG - Amato 12-1, 22-1
 Date/time completed: 9-12-18 Shipped Via: dD
 (UPS, FedEx, Hand Delivered, Pick-up, etc.)
 Airbill #: NA
 Matrix(s) Received: (Check all that apply): Soil/Solid Water Other: _____
 Cooler Number/Temperature: 1 / 8.2 = c / _____ = c / _____ = c (Describe) _____ = c
 Thermometer ID: 1003

Requirement Description	Yes	No	N/A	Comments (if any)
If samples require cooling, was the temperature between 0°C to ≤ 6°C ⁽¹⁾ ?		/		Same Day
Is there ice present (document if blue ice is used)	/			
Are custody seals present on cooler? (if so, document in comments if they are signed and dated, broken or intact)		/		
Are custody seals present on each sample container? (if so, document in comments if they are signed and dated, broken or intact)		/		
Were all samples received intact ⁽¹⁾ ?	/			
Was adequate sample volume provided ⁽¹⁾ ?	/			
Are short holding time analytes or samples with HTs due within 48 hours present ⁽¹⁾ ?	/			pk
Is a chain-of-custody (COC) present and filled out completely ⁽¹⁾ ?	/			
Does the COC agree with the number and type of sample bottles received ⁽¹⁾ ?	/			
Do the sample IDs on the bottle labels match the COC ⁽¹⁾ ?	/			
Is the COC properly relinquished by the client with date and time recorded ⁽¹⁾ ?	/			
For volatiles in water – is there headspace (> ¼ inch bubble) present? If yes, contact client and note in narrative.			/	
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)			/	
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.

[Signature] Reviewed by (Project Manager) 9/12/18 Date/Time Reviewed

Origins Laboratory, Inc.

[Signature]

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

Brian Sulzberger
 Project Number: 014218190
 Project: KMG - Amato 12-1, 22-1

B01@6'

9/12/2018 11:10:00AM

Analyte	Result	Limit	Units	Dilution	Batch	Analyst	Prepared	Analyzed	Notes
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Origins Laboratory, Inc.
Y809133-01 (Soil)

DRO/RRO by EPA8015C

Diesel (C10-C28)	ND	25.0	mg/kg	1	B811204	JTD	09/12/2018	09/12/2018	U
Residual Range Organics (C28-C40)	ND	100	"	"	"	JTD	"	"	U

Surrogate: o-Terphenyl 67.9 % 59-131 " " "

GBTEX by EPA 8260C

Gasoline Range Hydrocarbons	ND	0.200	mg/kg	1	B811207	JTD	09/12/2018	09/12/2018	U
Benzene	ND	0.002	"	"	"	JTD	"	"	U
Toluene	ND	0.002	"	"	"	JTD	"	"	U
Ethylbenzene	ND	0.002	"	"	"	JTD	"	"	U
Xylenes, total	ND	0.002	"	"	"	JTD	"	"	U

Surrogate: 1,2-Dichloroethane-d4 98.1 % 70-130 " " "

Surrogate: Toluene-d8 97.3 % 70-130 " " "

Surrogate: 4-Bromofluorobenzene 93.6 % 70-130 " " "

pH in Soil by EPA 9045D

pH	6.46		pH Units	1	B811205	JTD	09/12/2018	09/12/2018	
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Specific Conductance by Modified 9050A

Specific Conductance (EC)	0.0790	0.00500	mmhos/cm	"	B811206	JTD	"	"	
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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: 014218190
 Project: KMG - Amato 12-1, 22-1

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 B811207 - EPA 5030 (soil)

Blank (B811207-BLK1)

Prepared: 09/12/2018 Analyzed: 09/12/2018

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	60		ug/kg	62.5		95.6	70-130			
Surrogate: Toluene-d8	61		"	62.5		96.9	70-130			
Surrogate: 4-Bromofluorobenzene	60		"	62.5		95.2	70-130			

Origins Laboratory, Inc.



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 Arvada CO 80003

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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 B811207 - EPA 5030 (soil)

LCS (B811207-BS1)

Prepared: 09/12/2018 Analyzed: 09/12/2018

Benzene	0.096	0.002	mg/kg	0.100		96.4	77.1-124			
Toluene	0.089	0.002	"	0.100		88.6	74.5-128			
Ethylbenzene	0.086	0.002	"	0.100		85.6	66.4-127			
m,p-Xylene	0.180	0.004	"	0.200		90.0	76.6-124			
o-Xylene	0.091	0.002	"	0.100		91.0	76.6-124			
Surrogate: 1,2-Dichloroethane-d4	58		ug/kg	62.5		93.6	70-130			
Surrogate: Toluene-d8	61		"	62.5		97.8	70-130			
Surrogate: 4-Bromofluorobenzene	64		"	62.5		102	70-130			

Origins Laboratory, Inc.



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Brian Sulzberger
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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 B811207 - EPA 5030 (soil)

Matrix Spike (B811207-MS1)	Source: Y809140-01			Prepared: 09/12/2018 Analyzed: 09/12/2018						
Benzene	0.090	0.002	mg/kg	0.100	0.0005	90.0	71.8-126			
Toluene	0.081	0.002	"	0.100	ND	81.0	65.1-130			
Ethylbenzene	0.078	0.002	"	0.100	ND	77.7	62.2-130			
m,p-Xylene	0.165	0.004	"	0.200	ND	82.5	46.5-137			
o-Xylene	0.084	0.002	"	0.100	ND	84.0	54.2-134			
Surrogate: 1,2-Dichloroethane-d4	59		ug/kg	62.5		93.9	70-130			
Surrogate: Toluene-d8	60		"	62.5		95.7	70-130			
Surrogate: 4-Bromofluorobenzene	64		"	62.5		103	70-130			

Origins Laboratory, Inc.



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

Brian Sulzberger
 Project Number: 014218190
 Project: KMG - Amato 12-1, 22-1

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 B811207 - EPA 5030 (soil)

Matrix Spike Dup (B811207-MSD1)	Source: Y809140-01			Prepared: 09/12/2018 Analyzed: 09/12/2018						
Benzene	0.095	0.002	mg/kg	0.100	0.0005	95.1	71.8-126	5.45	11.3	
Toluene	0.085	0.002	"	0.100	ND	84.8	65.1-130	4.63	15.4	
Ethylbenzene	0.083	0.002	"	0.100	ND	83.1	62.2-130	6.77	19.6	
m,p-Xylene	0.176	0.004	"	0.200	ND	87.8	46.5-137	6.26	19.2	
o-Xylene	0.089	0.002	"	0.100	ND	88.9	54.2-134	5.64	17.9	
Surrogate: 1,2-Dichloroethane-d4	59		ug/kg	62.5		94.4	70-130			
Surrogate: Toluene-d8	60		"	62.5		95.3	70-130			
Surrogate: 4-Bromofluorobenzene	64		"	62.5		103	70-130			

Origins Laboratory, Inc.



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

Brian Sulzberger
 Project Number: 014218190
 Project: KMG - Amato 12-1, 22-1

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 B811204 - EPA 3550B

Blank (B811204-BLK1)

Prepared: 09/12/2018 Analyzed: 09/12/2018

Diesel (C10-C28)	ND	50.0	mg/kg							U
Residual Range Organics (C28-C40)	ND	200	"							U
Surrogate: o-Terphenyl	35		"	50.0		69.1	59-131			

Blank (B811204-BLK2)

Prepared: 09/12/2018 Analyzed: 09/12/2018

Diesel (C10-C28)	ND	50.0	mg/kg							U
Residual Range Organics (C28-C40)	ND	200	"							U
Surrogate: o-Terphenyl	32		"	50.0		63.9	59-131			

LCS (B811204-BS1)

Prepared: 09/12/2018 Analyzed: 09/12/2018

Diesel (C10-C28)	843	50.0	mg/kg	1000		84.3	64-121			
Residual Range Organics (C28-C40)	891	200	"	1000		89.1	58-124			
Surrogate: o-Terphenyl	41		"	50.0		82.8	59-131			

LCS (B811204-BS2)

Prepared: 09/12/2018 Analyzed: 09/12/2018

Diesel (C10-C28)	757	50.0	mg/kg	1000		75.7	64-121			
Residual Range Organics (C28-C40)	852	200	"	1000		85.2	58-124			
Surrogate: o-Terphenyl	38		"	50.0		75.3	59-131			

Matrix Spike (B811204-MS1)

Source: Y809128-09

Prepared: 09/12/2018 Analyzed: 09/12/2018

Diesel (C10-C28)	827	50.0	mg/kg	1000	15.8	81.1	53-125			
Residual Range Organics (C28-C40)	889	200	"	1000	15.1	87.4	47-133			

Origins Laboratory, Inc.



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

Brian Sulzberger
 Project Number: 014218190
 Project: KMG - Amato 12-1, 22-1

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 B811204 - EPA 3550B										
Matrix Spike (B811204-MS1)		Source: Y809128-09			Prepared: 09/12/2018 Analyzed: 09/12/2018					
Surrogate: o-Terphenyl	39		mg/kg	50.0		78.5	59-131			
Matrix Spike (B811204-MS2)		Source: Y809140-01			Prepared: 09/12/2018 Analyzed: 09/12/2018					
Diesel (C10-C28)	769	50.0	mg/kg	1000	ND	76.9	53-125			
Residual Range Organics (C28-C40)	869	200	"	1000	7.42	86.2	47-133			
Surrogate: o-Terphenyl	39		"	50.0		78.5	59-131			
Matrix Spike Dup (B811204-MSD1)		Source: Y809128-09			Prepared: 09/12/2018 Analyzed: 09/12/2018					
Diesel (C10-C28)	835	50.0	mg/kg	1000	15.8	82.0	53-125	1.01	20	
Residual Range Organics (C28-C40)	876	200	"	1000	15.1	86.0	47-133	1.53	20	
Surrogate: o-Terphenyl	41		"	50.0		81.3	59-131			
Matrix Spike Dup (B811204-MSD2)		Source: Y809140-01			Prepared: 09/12/2018 Analyzed: 09/12/2018					
Diesel (C10-C28)	739	50.0	mg/kg	1000	ND	73.9	53-125	3.95	20	
Residual Range Organics (C28-C40)	855	200	"	1000	7.42	84.7	47-133	1.70	20	
Surrogate: o-Terphenyl	38		"	50.0		75.4	59-131			

Origins Laboratory, Inc.



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

Brian Sulzberger
 Project Number: 014218190
 Project: KMG - Amato 12-1, 22-1

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 B811205 - NO PREP										
Duplicate (B811205-DUP1)		Source: Y809136-01			Prepared: 09/12/2018 Analyzed: 09/12/2018					
pH	8.18		pH Units		8.19			0.122	25	
Batch B811206 - NO PREP										
Blank (B811206-BLK1)					Prepared: 09/12/2018 Analyzed: 09/12/2018					
Specific Conductance (EC)	0.00260	0.00500	mmhos/cm							
Duplicate (B811206-DUP1)		Source: Y809136-01			Prepared: 09/12/2018 Analyzed: 09/12/2018					
Specific Conductance (EC)	0.0788	0.00500	mmhos/cm		0.0791			0.380	25	

Origins Laboratory, Inc.



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

Brian Sulzberger
Project Number: 014218190
Project: KMG - Amato 12-1, 22-1

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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