



February 8, 2018

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

**Re: Sump Closure Summary Report
Strear Tank Battery 22-10 (Butterball 25C-34HZ)
Facility ID: 425966
NENW 10 2N67W
COGCC eForm 27 Initial Remediation #10981**

Dear Mr. Mickelson:

Apex Companies, LLC (Apex) is providing Kerr-McGee Oil & Gas Onshore LP (Kerr-McGee) with this Sump Closure Summary Report (Report) to document sampling activities and the results of environmental testing at the Strear Tank Battery 22-10 (Butterball 25C-34HZ). In accordance with the Initial eForm 27 - Remediation Number 10981 as approved by the COGCC, this form is being submitted to document produced water vessel closure activities. Apex provided the environmental services at the site, that included collection of confirmation samples from the excavation and documentation of field activities, as described below.

Site Assessment Activities

The field activities described herein were performed on October 20, 2017, with the purpose of assessing potential hydrocarbon impacts at the site related to the closure of a produced water vessel (sump). Soil sampling activities, laboratory analytical results, and conclusions are presented below. The general site layout and sample locations are provided on Figure 1.

The final extent of the excavation measured approximately 36 feet by 29 feet, at an approximate depth of 6.5 feet below ground surface (bgs). Impacted soil was not encountered in the excavation. A liner was present below the sump and groundwater was not encountered in the excavation.

Confirmation soil samples were collected from the sidewalls of the excavation area at approximately 4 feet bgs, and from the base of the excavation, beneath the location of the former produced water vessel and liner, at approximately 6.5 feet bgs. Soil samples were field-screened for volatile organic compound concentrations using a photoionization detector. The soil sample collected beneath the former produced water vessel location (B01@6.5') was submitted to Origins Laboratory in Denver, Colorado and analyzed for benzene, toluene, ethylbenzene, and total xylenes (BTEX), total petroleum hydrocarbons (TPH) – gasoline range organics (GRO) by United States Environmental Protection Agency (USEPA) Method 8260, TPH – diesel range and residual range organics (DRO and RRO, respectively) by USEPA Method 8015, electrical conductivity (EC), and pH. Soil analytical data is summarized in Table 1, and the laboratory analytical report is provided in Attachment A.

Results

Analytical results from soil sample B01@6.5' indicate that BTEX and TPH concentrations are below the applicable COGCC Table 910-1 standards. For both EC and pH, analytical results indicate that concentrations are within COGCC Table 910-1 allowable thresholds. The remaining soil samples, collected from the sidewalls of the excavation area, were not submitted for laboratory analysis as analytical data from the sample collected beneath the location of the former produced water vessel confirmed the absence of petroleum hydrocarbon impacts above COGCC Table 910-1 standards.

Conclusions

Analytical results described herein confirm BTEX and TPH impacts are not present at concentrations above applicable regulatory standards at the former sump location. Consequently, no further site assessment or remedial activity is necessary. Prior to site assessment activities, the sump was permanently removed.

Please contact me at (720) 501-5052 if you have any questions regarding this report or require additional information.

Sincerely,

Apex Companies, LLC



Chandler E Cole
Project Manager

Attachments:

Figure 1 – Strear Tank Battery 22-10 (Butterball 25C-34HZ) - Facility Layout & Analytical Results
Table 1 – Soil Sample Analytical Results
Attachment A – Laboratory Analytical Report



Figure 1
Strear Tank Battery 22-10
(Butterball 25C-34HZ)
- Facility Layout &
Analytical Results

Legend

- Soil Sample
- Former Crude Oil Tank
- Former Sump
- Former Secondary Containment
- Excavation Extent

Sample Location

- B: benzene
- T: toluene
- E: ethylbenzene
- X: xylenes
- TPH: total petroleum hydrocarbons

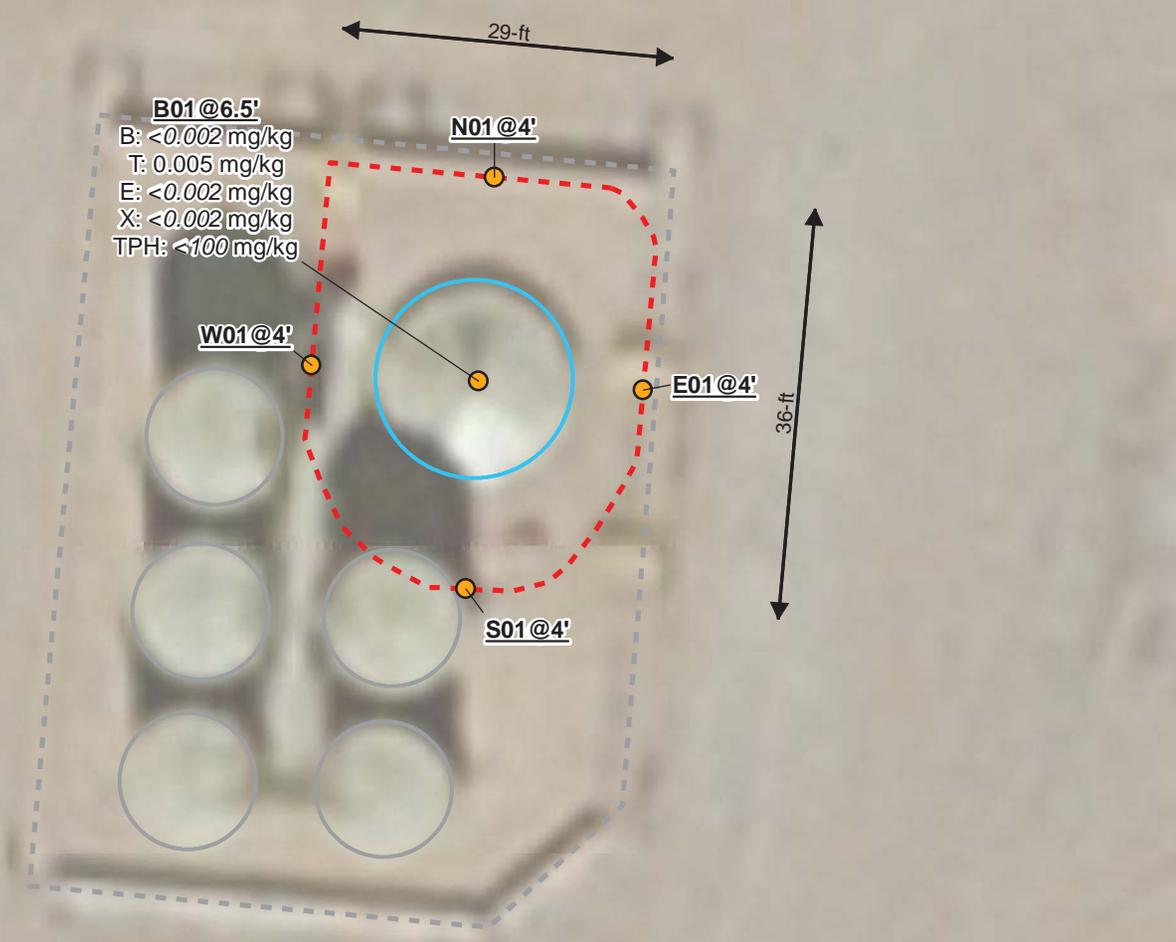
Bold values exceed COGCC Table 910-1 allowable concentrations

Site Characteristics

Legal Location: SENW, Sec 10, T2N R67W
County: Weld
Land Use: Non-Crop Land
Topography: 0-3% Slopes
Run-Off Risk: Very low
Soil Type: Valent sand

REVISED	BY	COMMENT
11/7/2017	BJB	Figure 1

Access Road



Non-Crop Land

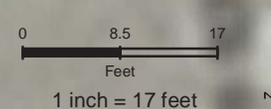


Illustration discrepancies may be present in this diagram due to the inherent limitations of the underlying imagery and field-collected measurements. The data and information in this diagram is consistent with field observations and field-collected measurements. Spatial data is available upon request.



Table 1 - Soil Sample Analytical Results

Kerr-McGee Oil & Gas Onshore LP
 Location Name: Strear Tank Battery 22-10 (Butterball 25C-34HZ)
 Facility ID: 425966
 County: Weld

Sample ID	Sample Date	Sample Depth (feet bgs)	Organics in Soil							Inorganics in Soil	
			TPH-GRO (mg/kg)	TPH-DRO (mg/kg)	TPH-RRO (mg/kg)	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Xylenes - total (mg/kg)	Electrical Conductivity (mmhos/cm) <small>(<4 or 2x background)</small>	pH <small>(6-9)</small>
B01@6.5'	10/20/17	6.5	<0.200	<25.0	<100	<0.002	0.005	<0.002	<0.002	0.0525	8.31

Notes:

- | | | | |
|-------------|---|----------|--|
| TPH | Total petroleum hydrocarbons | bgs | below ground surface |
| GRO | Gasoline range hydrocarbons (C6 - C10) | mg/kg | milligrams per kilogram |
| DRO | Diesel range organics (C10 - C28) | mmhos/cm | millimhos per centimeter |
| RRO | Residual range organics (C28 - C40) | NA | Not analyzed / not available |
| Bold | cell indicates result exceeded COGCC Table 910-1 allowable concentration for the contaminant / inorganic of concern | COGCC | Colorado Oil and Gas Conservation Commission |

Attachment A

Laboratory Analytical Report

October 20, 2017

Apex Companies, LLC
Chandler Cole
4150 Darley Avenue, Suite 1

Boulder CO 80305

Project Name - KMG - Butterball 25C-34HZ

Project Number - [none]

Attached are your analytical results for KMG - Butterball 25C-34HZ received by Origins Laboratory, Inc. October 20, 2017. This project is associated with Origins project number Y710306-01.

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



Apex Companies, LLC
4150 Darley Avenue, Suite 1
Boulder CO 80305

Chandler Cole
Project Number: [none]
Project: KMG - Butterball 25C-34HZ

CROSS REFERENCE REPORT

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
B01@6.5'	Y710306-01	Soil	October 20, 2017 11:03	10/20/2017 13:07

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.

Apex Companies, LLC
 4150 Darley Avenue, Suite 1
 Boulder CO 80305

Chandler Cole
 Project Number: [none]
 Project: KMG - Butterball 25C-34HZ

Origins Laboratory

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

Sample Receipt Checklist

Origins Work Order: 7710306

Client: Apex Co.

Client Project ID: mg. Butterball 25C - 34HZ

Checklist Completed by: DL

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

Date/time completed: 10-20-11 1311

Airbill #: NP

Matrix(s) Received: (Check all that apply): Soil/Solid Water Other: _____ (Describe)

Cooler Number/Temperature: 1 / 169 °C 1 °C 1 °C 1 °C

Thermometer ID: 7003

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"/>		sampled 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 ⁽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 10-20-11 1312

Origins Laboratory, Inc.



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Apex Companies, LLC
 4150 Darley Avenue, Suite 1
 Boulder CO 80305

Chandler Cole
 Project Number: [none]
 Project: KMG - Butterball 25C-34HZ

B01@6.5'
10/20/2017 11:03:00AM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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Origins Laboratory, Inc.
Y710306-01 (Soil)

DRO/RRO by EPA8015C

Diesel (C10-C28)	ND	25.0	mg/kg	1	B7J2003	10/20/2017	10/20/2017	U
Residual Range Organics (C28-C40)	ND	100	"	"	"	"	"	U

Surrogate: o-Terphenyl 94.5 % 59-131 " " "

GBTEX by EPA 8260C

Gasoline Range Hydrocarbons	ND	0.200	mg/kg	1	B7J2004	10/20/2017	10/20/2017	U
Benzene	ND	0.002	"	"	"	"	"	U
Toluene	0.005	0.002	"	"	"	"	"	
Ethylbenzene	ND	0.002	"	"	"	"	"	U
Xylenes, total	ND	0.002	"	"	"	"	"	U

Surrogate: 1,2-Dichloroethane-d4 107 % 70-130 " " "
Surrogate: Toluene-d8 103 % 70-130 " " "
Surrogate: 4-Bromofluorobenzene 107 % 70-130 " " "

pH in Soil by EPA 9045D

pH	8.31		pH Units	1	B7J2001	10/20/2017	10/20/2017	
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Specific Conductance by Modified 9050A

Specific Conductance (EC)	0.0525		mmhos/cm	"	B7J2005	10/20/2017	10/20/2017	
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Origins Laboratory, Inc.



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Apex Companies, LLC
 4150 Darley Avenue, Suite 1
 Boulder CO 80305

Chandler Cole
 Project Number: [none]
 Project: KMG - Butterball 25C-34HZ

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 B7J2004 - EPA 5030 (soil)

Blank (B7J2004-BLK1)

Prepared: 10/20/2017 Analyzed: 10/20/2017

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	70		ug/kg	62.5		113	70-130			
Surrogate: Toluene-d8	66		"	62.5		105	70-130			
Surrogate: 4-Bromofluorobenzene	63		"	62.5		101	70-130			

Origins Laboratory, Inc.



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Apex Companies, LLC
 4150 Darley Avenue, Suite 1
 Boulder CO 80305

Chandler Cole
 Project Number: [none]
 Project: KMG - Butterball 25C-34HZ

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 B7J2004 - EPA 5030 (soil)

LCS (B7J2004-BS1)

Prepared: 10/20/2017 Analyzed: 10/20/2017

Benzene	0.107	0.002	mg/kg	0.100		107	77.1-124			
Toluene	0.115	0.002	"	0.100		115	74.5-128			
Ethylbenzene	0.108	0.002	"	0.100		108	66.4-127			
m,p-Xylene	0.212	0.004	"	0.200		106	76.6-124			
o-Xylene	0.106	0.002	"	0.100		106	76.6-124			
Surrogate: 1,2-Dichloroethane-d4	61		ug/kg	62.5		97.8	70-130			
Surrogate: Toluene-d8	64		"	62.5		103	70-130			
Surrogate: 4-Bromofluorobenzene	62		"	62.5		100	70-130			

Origins Laboratory, Inc.



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Apex Companies, LLC
 4150 Darley Avenue, Suite 1
 Boulder CO 80305

Chandler Cole
 Project Number: [none]
 Project: KMG - Butterball 25C-34HZ

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 B7J2004 - EPA 5030 (soil)

Matrix Spike (B7J2004-MS1)	Source: Y710219-01			Prepared: 10/20/2017 Analyzed: 10/20/2017						
Benzene	0.123	0.002	mg/kg	0.100	ND	123	71.8-126			
Toluene	0.125	0.002	"	0.100	0.003	122	65.1-130			
Ethylbenzene	0.113	0.002	"	0.100	0.005	109	62.2-130			
m,p-Xylene	0.229	0.004	"	0.200	0.008	111	46.5-137			
o-Xylene	0.117	0.002	"	0.100	0.008	110	54.2-134			
Surrogate: 1,2-Dichloroethane-d4	70		ug/kg	62.5		111	70-130			
Surrogate: Toluene-d8	64		"	62.5		102	70-130			
Surrogate: 4-Bromofluorobenzene	65		"	62.5		103	70-130			

Origins Laboratory, Inc.



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Apex Companies, LLC
 4150 Darley Avenue, Suite 1
 Boulder CO 80305

Chandler Cole
 Project Number: [none]
 Project: KMG - Butterball 25C-34HZ

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 B7J2004 - EPA 5030 (soil)

Matrix Spike Dup (B7J2004-MSD1)	Source: Y710219-01			Prepared: 10/20/2017 Analyzed: 10/20/2017						
Benzene	0.090	0.002	mg/kg	0.100	ND	90.3	71.8-126	30.4	11.3	QR-02
Toluene	0.086	0.002	"	0.100	0.003	83.6	65.1-130	36.8	15.4	QR-02
Ethylbenzene	0.074	0.002	"	0.100	0.005	69.6	62.2-130	41.5	19.6	QR-02
m,p-Xylene	0.149	0.004	"	0.200	0.008	70.4	46.5-137	42.7	19.2	QR-02
o-Xylene	0.077	0.002	"	0.100	0.008	68.9	54.2-134	42.1	17.9	QR-02
Surrogate: 1,2-Dichloroethane-d4	73		ug/kg	62.5		116	70-130			
Surrogate: Toluene-d8	64		"	62.5		102	70-130			
Surrogate: 4-Bromofluorobenzene	64		"	62.5		102	70-130			

Origins Laboratory, Inc.



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Apex Companies, LLC
 4150 Darley Avenue, Suite 1
 Boulder CO 80305

Chandler Cole
 Project Number: [none]
 Project: KMG - Butterball 25C-34HZ

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 B7J2003 - EPA 3580

Blank (B7J2003-BLK1)

Prepared: 10/20/2017 Analyzed: 10/20/2017

Diesel (C10-C28)	ND	50.0	mg/kg							U
Residual Range Organics (C28-C40)	ND	200	"							U
Surrogate: o-Terphenyl	51		"	50.0		102	59-131			

LCS (B7J2003-BS1)

Prepared: 10/20/2017 Analyzed: 10/20/2017

Diesel (C10-C28)	1030	50.0	mg/kg	1000		103	64-121			
Residual Range Organics (C28-C40)	843	200	"	1000		84.3	58-124			
Surrogate: o-Terphenyl	46		"	50.0		91.0	59-131			

Matrix Spike (B7J2003-MS1)

Source: Y710219-01

Prepared: 10/20/2017 Analyzed: 10/20/2017

Diesel (C10-C28)	1070	50.0	mg/kg	1000	13.2	106	53-125			
Residual Range Organics (C28-C40)	815	200	"	1000	ND	81.5	47-133			
Surrogate: o-Terphenyl	45		"	50.0		89.4	59-131			

Matrix Spike Dup (B7J2003-MSD1)

Source: Y710219-01

Prepared: 10/20/2017 Analyzed: 10/20/2017

Diesel (C10-C28)	1190	50.0	mg/kg	1000	13.2	117	53-125	10.5	20	
Residual Range Organics (C28-C40)	972	200	"	1000	ND	97.2	47-133	17.5	20	
Surrogate: o-Terphenyl	48		"	50.0		95.5	59-131			

Origins Laboratory, Inc.



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Apex Companies, LLC
 4150 Darley Avenue, Suite 1
 Boulder CO 80305

Chandler Cole
 Project Number: [none]
 Project: KMG - Butterball 25C-34HZ

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 B7J2001 - NO PREP										
Duplicate (B7J2001-DUP1)		Source: Y710289-05			Prepared: 10/20/2017 Analyzed: 10/20/2017					
pH	7.11		pH Units		7.47			4.94	25	
Batch B7J2005 - NO PREP										
Blank (B7J2005-BLK1)		Prepared: 10/20/2017 Analyzed: 10/20/2017								
Specific Conductance (EC)	0.00250		mmhos/cm							
Duplicate (B7J2005-DUP1)		Source: Y710306-01			Prepared: 10/20/2017 Analyzed: 10/20/2017					
Specific Conductance (EC)	0.0478		mmhos/cm		0.0525			9.37	25	

Origins Laboratory, Inc.



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Apex Companies, LLC
4150 Darley Avenue, Suite 1
Boulder CO 80305

Chandler Cole
Project Number: [none]
Project: KMG - Butterball 25C-34HZ

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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