



January 18, 2019

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

**Re: Sump Closure Summary Report
ZADEL 16C-35HZ TANK BATTERY
Location ID: 336625
SWSW– Sec34 – T4N - R67W
COGCC Remediation Number 12301**

Dear Mr. Hamilton:

Apex Companies, LLC (Apex) is providing Kerr-McGee Oil & Gas Onshore, LP (Kerr-McGee) with this Sump Closure Summary Report to document sampling activities and the results of environmental testing at the tank battery associated with the ZADEL 16C-35HZ well. This form is being submitted to document the activities related to the closure of a produced water sump under Remediation Number 12301, as approved by the COGCC. Apex provided the environmental services at the site that included collection of confirmation soil samples from the sump removal, and documentation of field activities, as described below.

Site Assessment Activities

The field activities described herein were performed on October 19, 2018, with the purpose of assessing potential hydrocarbon impacts at the site related to the closure and replacement of a partially buried produced water sump. Soil sampling activities, laboratory analytical results, and conclusions are presented below. The general site layout and sample locations are provided in Figure 1.

The final extent of excavation measured approximately 17 feet by 22 feet, at an approximate depth of 5.5 feet below ground surface (bgs). Impacted soil and groundwater were not encountered within the excavation.

Confirmation soil samples were collected from the excavation in relation to the sump removed. The decommissioned sump samples were collected from the base at approximately 5.5 feet bgs and four sidewalls at approximately 3 feet bgs. The base and four sidewall soil samples were field-screened for volatile organic vapor values using a photoionization detector. Based on field screening results, the base (B01@5.5') was submitted to Origins Laboratory in Denver, Colorado. The sample was analyzed for benzene, toluene, ethylbenzene, and total xylenes (BTEX) and 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 are summarized in Table 1 and the laboratory analytical report is provided in Attachment A.

Results

Analytical results from the confirmation soil sample (B01@5.5') collected from the final extent of the excavation indicate that BTEX, TPH, EC, and pH concentrations were in full compliance with COGCC Table 910-1 Standards. The remaining samples collected from the excavation area were not submitted for laboratory analysis, as analytical data from the submitted sample and field-screened samples 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 partially buried produced water sump location. Consequently, no further site assessment or remedial activity is necessary and a new produced water sump has been installed in the location of the former sump.

Please contact me at (720) 501-5065 if you have any questions regarding this report or require additional information.

Sincerely,

Apex Companies, LLC

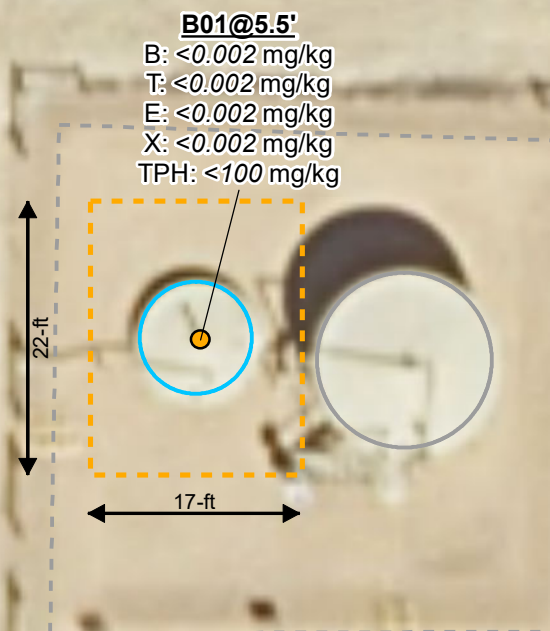
Maggie Graham

Maggie Graham
Senior Project Manager

Attachments:

Figure 1 – ZADEL 16C-35HZ- Facility Layout & Sample Locations
Table 1 – Soil Sample Analytical Results
Attachment A – Laboratory Analytical Report

Cropland



B01@5.5'
B: <0.002 mg/kg
T: <0.002 mg/kg
E: <0.002 mg/kg
X: <0.002 mg/kg
TPH: <100 mg/kg

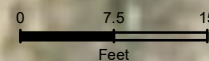
22-ft

17-ft

Rangeland

Access Road

For illustration purposes, spatial data in this diagram (e.g. sample points, excavation perimeter) is representative of field observations, and for illustration purposes may have been adjusted to align with aerial imagery and other pictured spatial data. Apex also collects spatial data using GPS units with real-time differential correction and sub-meter accuracy. Spatial data (e.g. ESRI shapefiles, Google Earth KMZ) provided separately from this diagram, may not be consistent with what is presented in this site diagram, due to adjustments made for illustrative purposes.



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Figure 1
Zadel 16C-35HZ -
Facility Layout &
Sample Locations

Legend

- Soil Sample (10/19/2018)
- Former Crude Oil Tank
- Former Produced Water Sump
- Former Secondary Containment
- Excavation Extent (10/19/2018)

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: SWSW, Sec 34, T4N R67W
County: Weld
Land Use: Cropland
Topography: 3-9% Slopes
Run-Off Risk: Not Available
Soil Type: Nelson fine sandy loam

REVISED	BY	COMMENT
11/26/2018	BJB	Figure 1

Apex Companies, LLC
beau.bergstrom@apexcos.com
M:\Projects\Anadarko\DJL_Basin\Remediation\Zadel_16C-35HZ\Zadel_16C-35HZ_Fig1.dwg 20181029.mxd

Table 1 - Soil Laboratory Results

Kerr-McGee Oil and Gas Onshore LP
 Location Name: ZADEL 16C-35HZ
 Location ID: 336625
 County: Weld

			Organics (mg/kg [ppm])								
COGCC Allowable Concentration (Soil) -->			500			0.17	85	100	175	4	(6-9)
Sample ID:	Sample Date:	Sample Depth:	TPH-GRO (C6-C10) Low Fraction	TPH-DRO (C10-C28) High Fraction	TPH-RRO (C28-C40) High Fraction	Benzene	Toluene	Ethylbenzene	Xylenes - total	EC (<4 mmhos/cm or 2x background)	pH (unit)
*B01@5.5'	10/19/18	5.5'	<0.200	<25.0	<100	<0.002	<0.002	<0.002	<0.002	0.0888	8.85

Notes:

TPH Total Petroleum Hydrocarbons
 GRO Gasoline Range Organics (C6-C10)
 DRO Diesel Range Organics (C10-C28)
 RRO Residual Range Organics (C28-C36)
Indicates results exceeded COGCC Table 910-1 allowable concentration

bgs below ground surface
 mg/kg milligrams per kilogram
 mmhos/cm millimhos per centimeter
 NA Not analyzed/ Not Applicable
 COGCC Colorado Oil and Gas Conservation Commission
 * Sample was collected below the designated root zone (>3' bgs)

Attachment A

Laboratory Analytical Report



December 04, 2018

Apex Companies, LLC

Maggie Graham

4150 Darley Avenue, Suite 1

Boulder

CO 80305

Project Name - KMG - Zadel 16C-35HZ

Project Number - COT0136

Attached are your analytical results for KMG - Zadel 16C-35HZ received by Origins Laboratory, Inc. October 19, 2018. This project is associated with Origins project number Y810322-01.

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

Apex Companies, LLC

4150 Darley Avenue, Suite 1

Boulder CO 80305

Maggie Graham

Project Number: COT0136

Project: KMG - Zadel 16C-35HZ

CROSS REFERENCE REPORT

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
B01@5.5'	Y810322-01	Soil	October 19, 2018 12:07	10/19/2018 16:22

Per the email from Maggie on 12/4/18, the project name was changed to Zadel 16C-35HZ.

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

Maggie Graham
Project Number: COT0136
Project: KMG - Zadel 16C-35HZ

www.originslaboratory.com

180322

page 1 of 1

ORIGINS

LABORATORY, INC

Client: Apex Companies
Address: 1746 Cole Blvd, Lakewood, CO 80401
Telephone Number: 720-501-5065
Email Address: Maggie.Graham@apexcos.com

Project Manager: Maggie Graham
Project Name: Zadel 33-34
Project Number: WO# COT0136 Greg Hamilton
Samples Collected By: Kate Madanala
Bill to Anadarko

Sample ID Description	Date Sampled	Time Sampled	# of Containers	Preservative				Matrix			Analysis				Sample Instructions
				HCl	HNO ₃	Other	Groundwater	Soil	Air Sample	Other	GRTEX	DRO/RRO	EC, pH	HOLD SAR	
B01055'	10/19/18	1207	1	X				X				X	X	X	Same day
N0103'		1209	1	X				X				X			TAT
E0103'		1211	1	X				X				X			(Monday)
S0103'		1213	1	X				X				X			Morning
N0103'		1215	1	X				X				X			10/22/18
B60105'		1217	1	X				X				X			

Relinquished By:	Date:	Time:	Received By:	Date:	Time:	Turnaround Time:
	10/19/18	1622		10-15-18	1622	Same Day <input checked="" type="checkbox"/> 24 Hr <input type="checkbox"/>
						48 Hr <input type="checkbox"/> 72 Hr <input type="checkbox"/>
						Standard <input type="checkbox"/>

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

Origins Laboratory, Inc.

Jefe Pellegrini

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

Maggie Graham
Project Number: COT0136
Project: KMG - Zadel 16C-35HZ

Origins Laboratory

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

Sample Receipt Checklist

Origins Work Order: 4810322

Client: Apex Co

Client Project ID: KMG-Zadel 33-34

Checklist Completed by: [Signature]

Shipped Via: HD

(UPS, FedEx, Hand Delivered, Pick-up, etc.)

Date/time completed: 10-18-12

Airbill #: RA

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

(Describe)

Cooler Number/Temperature: 14.5 °C 1 °C 1 °C 1 °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⁾ ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Is there ice present (document if blue ice is used)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Are custody seals present on cooler? (if so, document in comments if they are signed and dated, broken or intact)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input 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 type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Were all samples received intact ⁽¹⁾ ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Was adequate sample volume provided ⁽¹⁾ ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Are short holding time analytes or samples with HTs due within 48 hours present ⁽¹⁾ ?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Is a chain-of-custody (COC) present and filled out completely ⁽¹⁾ ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Does the COC agree with the number and type of sample bottles received ⁽¹⁾ ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Do the sample IDs on the bottle labels match the COC ⁽¹⁾ ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Is the COC properly relinquished by the client with date and time recorded ⁽¹⁾ ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
For volatiles in water – is there headspace (> ¼ inch bubble) present? If yes, contact client and note in narrative.	<input type="checkbox"/>	<input type="checkbox"/>	<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 type="checkbox"/>	<input type="checkbox"/>	<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: [Signature] (Project Manager)

Date/Time Reviewed: 10-19-12

Origins Laboratory, Inc.

[Signature]

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

Maggie Graham
Project Number: COT0136
Project: KMG - Zadel 16C-35HZ

B01@5.5'

10/19/2018 12:07:00PM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Analyst	Prepared	Analyzed	Notes
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Origins Laboratory, Inc.
Y810322-01 (Soil)

DRO/RRO by EPA8015C

Diesel (C10-C28)	ND	25.0	mg/kg	1	B8J1904	KDK	10/19/2018	10/21/2018	U
Residual Range Organics (C28-C40)	ND	100	"	"	"	KDK	"	"	U

Surrogate: o-Terphenyl 92.9 % 59-131 " " "

GBTEX by EPA 8260C

Gasoline Range Hydrocarbons	ND	0.200	mg/kg	1	B8J1907	KDK	10/19/2018	10/21/2018	U
Benzene	ND	0.002	"	"	"	KDK	"	"	U
Toluene	ND	0.002	"	"	"	KDK	"	"	U
Ethylbenzene	ND	0.002	"	"	"	KDK	"	"	U
Xylenes, total	ND	0.002	"	"	"	KDK	"	"	U

Surrogate: 1,2-Dichloroethane-d4 105 % 70-130 " " "
Surrogate: Toluene-d8 97.2 % 70-130 " " "
Surrogate: 4-Bromofluorobenzene 99.8 % 70-130 " " "

pH in Soil by EPA 9045D

pH	8.85		pH Units	1	B8J2204	DJL	10/22/2018	10/22/2018	
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Specific Conductance by Modified 9050A

Specific Conductance (EC)	0.153	0.00500	mmhos/cm	"	B8J2205	OLAB	"	10/22/2018	
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Origins Laboratory, Inc.



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

Maggie Graham
Project Number: COT0136
Project: KMG - Zadel 16C-35HZ

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 B8J1907 - EPA 5030 (soil)										
Blank (B8J1907-BLK1)					Prepared: 10/19/2018 Analyzed: 10/19/2018					
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	65		ug/kg	62.5		104	70-130			
Surrogate: Toluene-d8	61		"	62.5		98.1	70-130			
Surrogate: 4-Bromofluorobenzene	63		"	62.5		100	70-130			

Origins Laboratory, Inc.



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Boulder CO 80305

Maggie Graham
Project Number: COT0136
Project: KMG - Zadel 16C-35HZ

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 B8J1907 - EPA 5030 (soil)										
LCS (B8J1907-BS1)					Prepared: 10/19/2018 Analyzed: 10/19/2018					
Benzene	0.107	0.002	mg/kg	0.100		107	77.1-124			
Toluene	0.114	0.002	"	0.100		114	74.5-128			
Ethylbenzene	0.114	0.002	"	0.100		114	66.4-127			
m,p-Xylene	0.234	0.004	"	0.200		117	76.6-124			
o-Xylene	0.113	0.002	"	0.100		113	76.6-124			
Surrogate: 1,2-Dichloroethane-d4	57		ug/kg	62.5		90.7	70-130			
Surrogate: Toluene-d8	63		"	62.5		101	70-130			
Surrogate: 4-Bromofluorobenzene	61		"	62.5		97.4	70-130			

Origins Laboratory, Inc.



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Apex Companies, LLC
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Boulder CO 80305

Maggie Graham
Project Number: COT0136
Project: KMG - Zadel 16C-35HZ

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 B8J1907 - EPA 5030 (soil)

Matrix Spike (B8J1907-MS1)		Source: Y810310-01			Prepared: 10/19/2018 Analyzed: 10/19/2018					
Benzene	0.094	0.002	mg/kg	0.100	ND	94.1	71.8-126			
Toluene	0.098	0.002	"	0.100	ND	98.1	65.1-130			
Ethylbenzene	0.099	0.002	"	0.100	0.0006	99.1	62.2-130			
m,p-Xylene	0.203	0.004	"	0.200	0.001	101	46.5-137			
o-Xylene	0.099	0.002	"	0.100	0.0008	98.2	54.2-134			
Surrogate: 1,2-Dichloroethane-d4	59		ug/kg	62.5		94.5	70-130			
Surrogate: Toluene-d8	62		"	62.5		98.8	70-130			
Surrogate: 4-Bromofluorobenzene	62		"	62.5		98.6	70-130			

Origins Laboratory, Inc.



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

Maggie Graham
Project Number: COT0136
Project: KMG - Zadel 16C-35HZ

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 B8J1907 - EPA 5030 (soil)										
Matrix Spike Dup (B8J1907-MSD1)		Source: Y810310-01			Prepared: 10/19/2018 Analyzed: 10/19/2018					
Benzene	0.097	0.002	mg/kg	0.100	ND	97.4	71.8-126	3.43	11.3	
Toluene	0.103	0.002	"	0.100	ND	103	65.1-130	4.39	15.4	
Ethylbenzene	0.100	0.002	"	0.100	0.0006	100	62.2-130	1.08	19.6	
m,p-Xylene	0.205	0.004	"	0.200	0.001	102	46.5-137	0.931	19.2	
o-Xylene	0.102	0.002	"	0.100	0.0008	101	54.2-134	2.95	17.9	
Surrogate: 1,2-Dichloroethane-d4	59		ug/kg	62.5		94.5	70-130			
Surrogate: Toluene-d8	62		"	62.5		99.0	70-130			
Surrogate: 4-Bromofluorobenzene	61		"	62.5		97.4	70-130			

Origins Laboratory, Inc.



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

Maggie Graham
Project Number: COT0136
Project: KMG - Zadel 16C-35HZ

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
---------	--------	-----------------	-------	-------------	---------------	------	-------------	-----	-----------	-------

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 B8J1904 - EPA 3580

Blank (B8J1904-BLK1)

Prepared: 10/19/2018 Analyzed: 10/19/2018

Diesel (C10-C28)	ND	50.0	mg/kg							U
Residual Range Organics (C28-C40)	ND	200	"							U
Surrogate: o-Terphenyl	48		"	50.0		96.3	59-131			

LCS (B8J1904-BS1)

Prepared: 10/19/2018 Analyzed: 10/19/2018

Diesel (C10-C28)	1200	50.0	mg/kg	1000		120	64-121			
Residual Range Organics (C28-C40)	938	200	"	1000		93.8	58-124			
Surrogate: o-Terphenyl	55		"	50.0		109	59-131			

Matrix Spike (B8J1904-MS1)

Source: Y810293-01

Prepared: 10/19/2018 Analyzed: 10/19/2018

Diesel (C10-C28)	1030	50.0	mg/kg	1000	ND	103	53-125			
Residual Range Organics (C28-C40)	803	200	"	1000	21.6	78.1	47-133			
Surrogate: o-Terphenyl	48		"	50.0		95.1	59-131			

Matrix Spike Dup (B8J1904-MSD1)

Source: Y810293-01

Prepared: 10/19/2018 Analyzed: 10/19/2018

Diesel (C10-C28)	1000	50.0	mg/kg	1000	ND	100	53-125	3.02	20	
Residual Range Organics (C28-C40)	787	200	"	1000	21.6	76.5	47-133	2.02	20	
Surrogate: o-Terphenyl	46		"	50.0		93.0	59-131			

Origins Laboratory, Inc.



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

Maggie Graham
Project Number: COT0136
Project: KMG - Zadel 16C-35HZ

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 B8J2204 - NO PREP										
Duplicate (B8J2204-DUP1)	Source: Y810320-01				Prepared: 10/22/2018 Analyzed: 10/22/2018					
pH	8.50		pH Units		9.00			5.71	25	
Batch B8J2205 - NO PREP										
Blank (B8J2205-BLK1)	Prepared: 10/22/2018 Analyzed: 10/22/2018									
Specific Conductance (EC)	0.00150	0.00500	mmhos/cm							
Duplicate (B8J2205-DUP1)	Source: Y810320-01				Prepared: 10/22/2018 Analyzed: 10/22/2018					
Specific Conductance (EC)	0.120	0.00500	mmhos/cm		0.100			17.7	25	

Origins Laboratory, Inc.



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

Maggie Graham
Project Number: COT0136
Project: KMG - Zadel 16C-35HZ

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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