

November 2, 2017

Great Western Operating Company, LLC  
1801 Broadway, Suite 500  
Denver, Colorado 80202

Attention: Scot Donato, EH&S/Regulatory Manager

Subject: September 2017 Groundwater Sampling  
Haas #1 Former Production Site  
Weld County, Colorado  
Project Number 160884.EC

Dear Mr. Donato,

As requested, A. G. Wassenaar, Inc. (AGW) has conducted groundwater sampling at the Haas #1 former production site in Weld County, Colorado. The sampling activities were completed on September 22, 2017. This was the first sampling event to occur since AGW installed three (3) monitoring wells and conducted groundwater sampling at the site in March 2017. This letter summarizes the project activities and analytical results.

## **BACKGROUND**

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The site is located in the northeast  $\frac{1}{4}$  of the southeast  $\frac{1}{4}$  of Section 15, Township 6 North, Range 67 West; northwest of the intersection of Highway 392 and County Road 21 in Weld County, Colorado. The site formerly contained one (1) aboveground steel tank for condensate storage, one (1) aboveground tank for produced water storage, and one (1) separate earthen containment berm for the separator.

In March 2016, Great Western Operating Company, LLC (GWOC) requested that AGW visit the Haas #1 facility to collect soil samples following the excavation of approximately 250 cubic yards of visibly impacted soil in the vicinity of the former produced water storage vessel. On March 15, 2016, AGW collected soil samples from the walls and base of the excavation, and from the stockpiled soils. Based on the analytical results, impacted soils remained at the site.

GWOC notified the COGCC, Weld County, the Town of Windsor, and the surface owner of the historical release on March 22, 2016, and a Form 19 Spill/Release Report was submitted on March 24, 2016. A supplemental Spill/Release Report was submitted on April 1, 2016.

In May 2016, AGW completed additional soil and groundwater sampling to define the extent of impact in the vicinity of the release. The results of the May 3, 2016 investigation determined that groundwater had been impacted at the site, that impacted soil remained at the site, and additional excavation was needed.

To address the remaining impacted soils and groundwater at the site, on October 4 and October 5, 2016, the excavation at the Haas #1 facility was extended, and 650 cubic yards of additional impacted soils were

removed. AGW conducted post-excavation soil sampling from each of the four walls of the excavation. Based on the analytical results, impacted soils were removed laterally and to the depth of groundwater. 1,150 pounds of COGAC™ (Chemically Oxygenated Granular Activated Carbon) were incorporated into the soil and groundwater at the base of the excavation. COGAC™, a patented injection material by Remington Technologies, LLC, degrades contaminants via chemical oxidation and passive bio-stimulation, as well as mitigating desorbed contaminant mass. Additionally, PVC pipe was installed horizontally within the excavation to provide access to groundwater for possible future remediation efforts.

To monitor the effectiveness of the remediation activities, in March 2017, AGW installed and sampled three (3) monitoring wells at the Haas #1 site. The three (3) wells were sampled again on September 22, 2017. Details of the groundwater sampling methods and results are included below.

## **GROUNDWATER SAMPLING**

AGW conducted the second groundwater sampling event of the three (3) onsite monitoring wells on September 22, 2017.

### ***Groundwater Elevation Measurements***

Table 1, below, summarizes the groundwater depth measurements and elevations on September 22, 2017.

**Table 1: Groundwater Depths  
Haas #1  
September 22, 2017**

<b>Well Number</b>	<b>Top of Casing (TOC) Elevation</b>	<b>Depth to Groundwater (TOC)</b>	<b>Groundwater Elevation</b>
MW-1	100.00	9.85	90.15
MW-2	99.45	9.67	89.78
MW-3	99.74	9.87	89.87

Elevations are in feet based on a site datum of 100.00 feet. Benchmark is the top of MW-1 well pipe casing.

Based on the survey elevation data and groundwater levels collected on September 22, 2017, groundwater at the Haas #1 site flows to the south-southwest. Figure 1 in Attachment A illustrates the groundwater elevations and estimated flow direction.

### ***Groundwater Sampling Methods***

AGW collected groundwater samples from monitoring wells MW-1, MW-2, and MW-3 for analytical testing. To collect the samples, AGW utilized a dedicated plastic bailer attached to nylon cord at each borehole. Each sample was transferred into three acid-preserved glass vials supplied by the laboratory. The filled sample containers were immediately sealed, labeled, and placed into a cooler with ice (a preservative). The samples were delivered to Origins Laboratory, Inc. (Origins) of Denver, Colorado for analytical testing. During this project, AGW followed chain-of-custody procedures in general accordance with Environmental Protection Agency (EPA) guidelines. Origins analyzed all four groundwater samples for BTEX using EPA Method 8260C.

### Groundwater Analytical Results

Table 2, below, summarizes the groundwater analytical results. A copy of the laboratory report is included in Attachment B. The results are also illustrated on Figure 2 in Attachment A.

**Table 2: Groundwater Analytical Results  
Haas #1  
March 17 and September 22, 2017**

Sample Number	Date Sampled	Benzene	Toluene	Ethylbenzene	Total Xylenes
MW-1	3/17/17	0.00147	ND	ND	0.00365
	9/22/17	0.0103	ND	ND	ND
MW-2	3/17/17	<b>7.29</b>	0.791	0.535	2.38
	9/22/17	<b>3.980</b>	0.0373	0.170	0.464
MW-3	3/17/17	ND	ND	ND	ND
	9/22/17	ND	ND	ND	ND
COGCC Table 910-1 Concentrations (mg/L)		0.005	1.0	0.70	10.0

All concentrations are in mg/L = Milligrams per liter, parts per million

ND = Not detected above laboratory detection limits

Analytes in **bold** exceed their respective COGCC Table 910-1 concentration

To evaluate the groundwater analytical results, AGW consulted the Table 910-1 Concentration Levels provided within COGCC 900 Series Rules for Exploration and Production Waste Management. Based on the analytical results, groundwater collected in March and September 2017 from MW-1 and MW-3 did not contain BTEX concentrations greater than their respective COGCC Table 910 standards. Groundwater collected from MW-2 in September 2017 contained a benzene concentration of 3.980 milligrams per liter (mg/L), which is in exceedance of the COGCC Table 910-1 value of 0.005 mg/L; however, the benzene concentration has decreased from a concentration of 7.29 mg/L in March 2017.

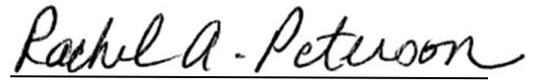
### DISCUSSION AND CONCLUSIONS

On September 22, 2017, AGW conducted the second groundwater sampling event of three (3) monitoring wells at the Haas #1 former production site, following well installation in March 2017. Based on analytical results, groundwater collected from MW-1, located in the area of the original release, and MW-3, located cross gradient of the original release, did not contain BTEX concentrations above the COGCC Table 910-1 concentrations. Groundwater collected from MW-2, located downgradient of the original release, contained benzene at a concentration greater than the COGCC Table 910-1 standard. However, the benzene concentration in groundwater at MW-2 has decreased since the March 2017 sampling event, suggesting that natural attenuation following soil removal is occurring. Ongoing quarterly groundwater monitoring is recommended to determine the continued effectiveness of remediation efforts at the Haas

#1 former production site. The next quarterly groundwater sampling event is scheduled for December 2017.

Thank you for your review of this report. If you have any questions or require further information, please call us at (303) 759-8373.

Sincerely,  
A.G. Wassenaar, Inc.



Rachel A. Peterson, P.G.  
Senior Project Manager

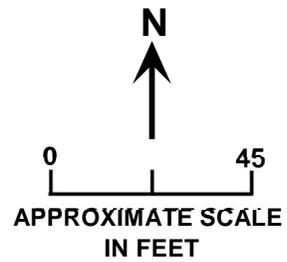
RAP/alb/mjg

Attachments

# ATTACHMENT A

## DIAGRAMS





**LEGEND**

- MONITORING WELL LOCATION
- 90.00' - GROUNDWATER ELEVATION (FEET)
- GROUNDWATER ELEVATION CONTOUR

NOTE: ALL LOCATIONS ARE APPROXIMATE

**A.G. WASSENAAR** | **INC.**

HAAS #1  
WELD COUNTY, COLORADO  
AGW PROJECT NUMBER: 160884

**FIGURE 1**  
GROUNDWATER ELEVATIONS  
AND FLOW DIRECTION

September 22, 2017



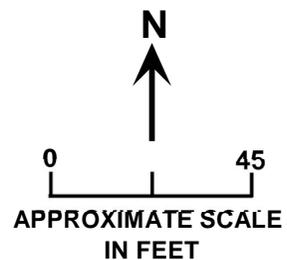
**LEGEND**

▲ - MONITORING WELL LOCATION

B: BENZENE  
 T: TOLUENE  
 E: ETHYLBENZENE  
 X: TOTAL XYLENES

ND: Not detected above laboratory detection limits

NOTE: All locations are approximate  
 Concentrations in milligrams per liter (mg/L)  
 Concentrations in **BOLD** exceed COGCC  
 Table 910-1



**A.G. WASSENAAR** | INC.

HAAS #1  
 WELD COUNTY, COLORADO  
 AGW PROJECT NUMBER: 160884

FIGURE 2  
 GROUNDWATER ANALYTICAL  
 RESULTS

September 22, 2017

**ATTACHMENT B**

**LABORATORY ANALYTICAL REPORTS**



October 02, 2017

**A.G. Wassenaar**

**Rachel Peterson**

**2180 South Ivanhoe Street - Suite 5**

**Denver**

**CO 80222**

**Project Name - HAAS #1**

**Project Number - 160884.EC**

Attached are your analytical results for HAAS #1 received by Origins Laboratory, Inc. September 25, 2017. This project is associated with Origins project number Y709339-01.

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



A.G. Wassenaar  
2180 South Ivanhoe Street - Suite 5  
Denver CO 80222

Rachel Peterson  
Project Number: 160884.EC  
Project: HAAS #1

CROSS REFERENCE REPORT

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-1	Y709339-01	Water	September 22, 2017 15:25	09/25/2017 08:47
MW-2	Y709339-02	Water	September 22, 2017 15:35	09/25/2017 08:47
MW-3	Y709339-03	Water	September 22, 2017 15:10	09/25/2017 08:47

Origins Laboratory, Inc.



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Jen Pellegrini For Noelle Doyle Mathis, President

A.G. Wassenaar  
 2180 South Ivanhoe Street - Suite 5  
 Denver CO 80222

Rachel Peterson  
 Project Number: 160884.EC  
 Project: HAAS #1

www.originslaboratory.com

7709339

page / of /

**ORIGINS**  
 LABORATORY, INC

Client: A.G. Wassenaar, Inc  
 Address: 2180 S Ivanhoe St. #5  
Denver, CO 80222  
 Telephone Number: 303-217-5112  
 Email Address: rp@originslab.com

Project Manager: Rachel Peterson  
 Project Name: HAAS #1  
 Project Number: 160884  
 Samples Collected By: ALB

Fax: 303.265.9645 | Phone: 303.433.1322

Sample ID Description	Date Sampled	Time Sampled	# of Containers	Preservative				Matrix			Analysis	Sample Instructions	
				Unpreserved	HCl	HNO <sub>3</sub>	Other	Groundwater	Soil	Air/Surface			Other
MW-1	9/22/17	15:25	3	X				X					1
MW-2	↓	15:35	3	X				X					2
MW-3	↓	15:10	3	X				X					3
													4
													5
													6
													7
													8
													9
													10
Relinquished By: <u>[Signature]</u>	Date: <u>9/25/17</u>	Time: <u>08:47</u>						Received By: <u>[Signature]</u>	Date: <u>9/25/17</u>	Time: <u>8:47</u>	Turnaround Time: <input type="checkbox"/> Same Day <input type="checkbox"/> 24 Hr <input checked="" type="checkbox"/> 48 Hr <input type="checkbox"/> 72 Hr <input checked="" type="checkbox"/> Standard		
Relinquished By: <u>[Signature]</u>	Date: <u>9/25/17</u>	Time: <u>8:47</u>						Received By: <u>[Signature]</u>	Date: <u>9/25/17</u>	Time: <u>8:47</u>			

Temp Received: 1.86 Date Results Needed

Origins Laboratory, Inc.

*Jefe Pellegrini*

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A.G. Wassenaar  
 2180 South Ivanhoe Street - Suite 5  
 Denver CO 80222

Rachel Peterson  
 Project Number: 160884.EC  
 Project: HAAS #1

Origins Laboratory

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

**Sample Receipt Checklist**

Origins Work Order: 4709339 Client: A.G. Wassenaar  
 Client Project ID: Haas #1  
 Checklist Completed by: Dan Shipped Via: HD  
 Date/time completed: 9-26-11 1345 (UPS, FedEx, Hand Delivered, Pick-up, etc.)  
 Airbill #: NA  
 Matrix(s) Received: (Check all that apply): Soil/Solid  Water  Other: \_\_\_\_\_  
 Cooler Number/Temperature: 1 / 1.8 °C \_\_\_\_\_ °C \_\_\_\_\_ °C (Describe) \_\_\_\_\_ °C  
 Thermometer ID: TC03

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> ?	/			
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 <sup>(1)</sup> ?	/			
Was adequate sample volume provided <sup>(1)</sup> ?	/			
Are short holding time analytes or samples with HTs due within 48 hours present <sup>(1)</sup> ?		/		
Is a chain-of-custody (COC) present and filled out completely <sup>(1)</sup> ?	/			
Does the COC agree with the number and type of sample bottles received <sup>(1)</sup> ?	/			
Do the sample IDs on the bottle labels match the COC <sup>(1)</sup> ?	/			
Is the COC properly relinquished by the client with date and time recorded <sup>(1)</sup> ?	/			
For volatiles in water – is there headspace (> ¼ inch bubble) present? <b>If yes, contact client and note in narrative.</b>		/		
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)		/		
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) [Signature]

Date/Time Reviewed 9-26-11 1345

Origins Laboratory, Inc.

*Jefe Pellegrini*

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 Denver CO 80222

Rachel Peterson  
 Project Number: 160884.EC  
 Project: HAAS #1

**MW-1**  
**9/22/2017 3:25:00PM**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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**Origins Laboratory, Inc.**  
**Y709339-01 (Water)**

**BTEX by EPA 8260C**

Benzene	10.3	1.00	ug/L	1	B712906	09/27/2017	09/29/2017	
Toluene	ND	1.00	"	"	"	"	"	U
Ethylbenzene	ND	1.00	"	"	"	"	"	U
Xylenes, total	ND	1.00	"	"	"	"	"	U

Surrogate: 1,2-Dichloroethane-d4	82.8 %	84-121			"	"	"	S-04
Surrogate: Toluene-d8	99.1 %	85-115			"	"	"	
Surrogate: 4-Bromofluorobenzene	95.6 %	84-114			"	"	"	

Origins Laboratory, Inc.



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Denver CO 80222

Rachel Peterson  
Project Number: 160884.EC  
Project: HAAS #1

**MW-2**

**9/22/2017 3:35:00PM**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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**Origins Laboratory, Inc.**  
Y709339-02 (Water)

**BTEX by EPA 8260C**

Benzene	3980	100	ug/L	100	B712906	09/27/2017	10/02/2017	
Toluene	37.3	1.00	"	1	"	"	09/29/2017	
Ethylbenzene	170	1.00	"	"	"	"	"	
Xylenes, total	464	1.00	"	"	"	"	"	
Surrogate: 1,2-Dichloroethane-d4	84.2 %	84-121			"	"	"	
Surrogate: Toluene-d8	98.6 %	85-115			"	"	"	
Surrogate: 4-Bromofluorobenzene	93.7 %	84-114			"	"	"	

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 Denver CO 80222

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 Project Number: 160884.EC  
 Project: HAAS #1

**MW-3**

**9/22/2017 3:10:00PM**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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**Origins Laboratory, Inc.**  
**Y709339-03 (Water)**

**BTEX by EPA 8260C**

Benzene	ND	1.00	ug/L	1	B712906	09/27/2017	10/02/2017	U
Toluene	ND	1.00	"	"	"	"	"	U
Ethylbenzene	ND	1.00	"	"	"	"	"	U
Xylenes, total	ND	1.00	"	"	"	"	"	U
Surrogate: 1,2-Dichloroethane-d4	98.0 %	84-121			"	"	"	
Surrogate: Toluene-d8	91.3 %	85-115			"	"	"	
Surrogate: 4-Bromofluorobenzene	107 %	84-114			"	"	"	

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 Denver CO 80222

Rachel Peterson  
 Project Number: 160884.EC  
 Project: HAAS #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
---------	--------	-----------------	-------	-------------	---------------	------	-------------	-----	-----------	-------

**Batch B712906 - EPA 5030B (Water)**

**Blank (B712906-BLK1)**

Prepared: 09/29/2017 Analyzed: 10/02/2017

Benzene	ND	1.00	ug/L							U
Toluene	ND	1.00	"							U
Ethylbenzene	ND	1.00	"							U
Xylenes, total	ND	1.00	"							U
Surrogate: 1,2-Dichloroethane-d4	60		"	62.5	96.5		84-121			
Surrogate: Toluene-d8	60		"	62.5	95.6		85-115			
Surrogate: 4-Bromofluorobenzene	60		"	62.5	95.3		84-114			

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 Project Number: 160884.EC  
 Project: HAAS #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
---------	--------	-----------------	-------	-------------	---------------	------	-------------	-----	-----------	-------

**Batch B712906 - EPA 5030B (Water)**

**LCS (B712906-BS1)**

Prepared: 09/29/2017 Analyzed: 10/02/2017

Benzene	48.2	1.00	ug/L	50.0		96.3	73.3-129			
Toluene	44.0	1.00	"	50.0		88.0	76.2-123			
Ethylbenzene	40.9	1.00	"	50.0		81.9	73.6-130			
m,p-Xylene	77.0	2.00	"	100		77.0	76.1-126			
o-Xylene	38.6	1.00	"	50.0		77.2	76.6-124			
Surrogate: 1,2-Dichloroethane-d4	64		"	62.5		102	84-121			
Surrogate: Toluene-d8	61		"	62.5		97.8	85-115			
Surrogate: 4-Bromofluorobenzene	61		"	62.5		97.9	84-114			

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 Project: HAAS #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
---------	--------	-----------------	-------	-------------	---------------	------	-------------	-----	-----------	-------

**Batch B712906 - EPA 5030B (Water)**

Matrix Spike (B712906-MS1)	Source: Y709409-01			Prepared: 09/29/2017 Analyzed: 10/02/2017						
Benzene	51.3	1.00	ug/L	50.0	ND	103	74-130			
Toluene	46.6	1.00	"	50.0	ND	93.2	73-131			
Ethylbenzene	47.1	1.00	"	50.0	ND	94.3	76-132			
m,p-Xylene	94.6	2.00	"	100	ND	94.6	69-139			
o-Xylene	43.9	1.00	"	50.0	ND	87.9	74-131			
Surrogate: 1,2-Dichloroethane-d4	62		"	62.5		99.0	84-121			
Surrogate: Toluene-d8	61		"	62.5		97.2	85-115			
Surrogate: 4-Bromofluorobenzene	58		"	62.5		93.3	84-114			

Origins Laboratory, Inc.



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 Denver CO 80222

Rachel Peterson  
 Project Number: 160884.EC  
 Project: HAAS #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
---------	--------	-----------------	-------	-------------	---------------	------	-------------	-----	-----------	-------

**Batch B712906 - EPA 5030B (Water)**

Matrix Spike Dup (B712906-MSD1)	Source: Y709409-01			Prepared: 09/29/2017 Analyzed: 10/02/2017						
Benzene	51.2	1.00	ug/L	50.0	ND	102	74-130	0.195	20	
Toluene	45.8	1.00	"	50.0	ND	91.5	73-131	1.86	20	
Ethylbenzene	48.2	1.00	"	50.0	ND	96.5	76-132	2.29	20	
m,p-Xylene	95.2	2.00	"	100	ND	95.2	69-139	0.675	20	
o-Xylene	44.2	1.00	"	50.0	ND	88.4	74-131	0.567	20	
Surrogate: 1,2-Dichloroethane-d4	64		"	62.5		102	84-121			
Surrogate: Toluene-d8	61		"	62.5		97.4	85-115			
Surrogate: 4-Bromofluorobenzene	59		"	62.5		94.9	84-114			

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Rachel Peterson

Project Number: 160884.EC

Project: HAAS #1

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### Notes and Definitions

U Sample is Non-Detect.

S-04 The surrogate recovery for this sample is outside of established control limits due to a sample matrix effect.

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