

February 2, 2018

Mr. Jacob Evans  
Senior Environmental Specialist  
Noble Energy, Inc.  
2115 117<sup>th</sup> Avenue  
Greeley, Colorado 80634

**RE: Groundwater Monitoring Report And No Further Action Request  
State 16-16I4 Flow Line  
Weld County, Colorado  
COGCC Tracking #2147149**

Dear Mr. Evans:

LT Environmental, Inc. (LTE), under the direction of Noble Energy, Inc. (Noble), conducted groundwater monitoring activities at the State 16-16I4 Flow Line (Site). The Site is located approximately 0.4 miles west of the intersection of County Road 44 and County Road 55 in Weld County, Colorado. The legal site description is the southwest quarter of the southeast quarter of Section 16, Township 4 North, Range 64 West, 6<sup>th</sup> Principal Meridian. The Site Location Map is provided as Figure 1.

This report describes the site history and a summary of the January 2018 groundwater monitoring activities.

## **SITE HISTORY**

On January 7 through 14, 2014, source removal excavation and confirmation soil sampling activities were conducted in response to the identification of a flow line release of petroleum hydrocarbons at the Site. The final extent of the excavation was approximately 95 feet north-south by approximately 75 feet east-west to an approximate depth of 8 feet below ground surface (bgs). Approximately 2,090 cubic yards of impacted soil was removed and transported to the Waste Management Buffalo Ridge Landfill in Keenesburg, Colorado, for final disposal. Confirmation soil samples collected from the final extents of the excavation indicated that soil exceeding the applicable Colorado Oil and Gas Conservation Commission (COGCC) Table 910-1 allowable levels was removed. Groundwater was encountered in the open excavation at an approximate depth of 6 feet bgs. A vacuum truck removed approximately 320 barrels of groundwater during excavation activities. One groundwater sample was collected from the open excavation and laboratory analytical results indicated that the sample exceeded the COGCC Table 910-1 allowable levels for benzene, toluene, and total xylenes. Prior to backfilling the excavation with clean fill material, 400 pounds of Chemically Oxygenated Granular Activated Carbon (COGAC™) was applied to the floor of the excavation as a remedial measure to mitigate the petroleum hydrocarbon impact to groundwater. A more detailed discussion of the initial excavation and remedial activities was presented in the LTE report *Remediation Activity Summary*, dated March 13, 2014.



On January 22, February 19, April 21, and September 16, 2014, soil borings were advanced and completed as temporary groundwater monitoring wells to delineate the lateral extent of petroleum hydrocarbon impact in groundwater at the Site. Details of the monitoring well installation events were described in previous reports.

On February 24, 2016, two air sparging (AS) wells (AS01 and AS02) were installed at the Site to remediate the remaining petroleum hydrocarbon impact in groundwater. AS wells AS01 and AS02 were constructed of 1" polyvinyl chloride casing with 2 feet of 0.010-inch slotted screen extending from the respective total depths of 13.5 feet and 14 feet bgs, respectively. Silica sand was placed in the 2.5 inch diameter annulus surrounding the PVC casing from total depth to approximately 3.5 feet above the top of the screened interval. A 1-foot bentonite pellet plug was placed above the silica sand and grout was placed above the bentonite plug to ground surface. The AS operations were conducted in 8-hour intervals of operation on a weekly basis beginning April 13, 2016 until the system was shut down on April 13, 2017, to begin groundwater monitoring under static conditions. The locations of the AS wells are presented on Figure 2.

## **GROUNDWATER MONITORING ACTIVITIES**

On January 8, 2018, groundwater monitoring was conducted in four monitoring wells (SB01 through SB04). Prior to purging, depth to groundwater was measured and recorded to calculate well-specific target purge volumes and relative groundwater elevations. Following purging, groundwater samples were collected, placed on ice, and delivered with a completed chain-of-custody to Summit Scientific (Summit) of Golden, Colorado, for analysis of BTEX by United States Environmental Protection Agency Method 8260C.

### **Hydrogeology**

During the January 2018 monitoring event, depth to groundwater ranged from 5.00 feet below top of casing (btoc) in monitoring well SB04 to 5.30 feet btoc in monitoring well SB01. Groundwater was calculated to flow northwest with an average hydraulic gradient of approximately 0.003 feet per foot. Groundwater elevations are presented on Figure 3 and summarized in Table 1.

### **Groundwater Analytical Results**

The Colorado Department of Public Health and Environment Water Quality Control Commission Regulation No. 41 – The Basic Standards for Groundwater (WQCC Reg 41) establishes BTEX concentrations in groundwater are 5.0 micrograms per liter ( $\mu\text{g/L}$ ), 560  $\mu\text{g/L}$ , 700  $\mu\text{g/L}$ , and 1,400  $\mu\text{g/L}$ , respectively. Laboratory groundwater analytical results indicated all monitoring wells were in compliance with applicable WQCC Reg 41 standards. Groundwater analytical results are presented on Figure 4 and summarized in Table 1. The laboratory groundwater analytical report is included as Attachment 1.





## SUMMARY

Groundwater laboratory analytical results from the January 2018 monitoring event indicated all samples are in compliance with applicable WQCC Reg 41 standards. The January 2018 groundwater monitoring event constitutes the fourth consecutive quarter with laboratory analytical results in compliance with applicable WQCC Reg 41 standards under static conditions. Confirmation soil sampling following source removal excavation activities indicated that all soil exceeding applicable COGCC Table 910-1 allowable levels has been removed from the Site. As a result, LTE suggests that Noble request that the COGCC grant a No Further Action status for the State 16-16I4 Flow Line.

LTE appreciates the opportunity to provide environmental services to Noble. Please call me at 303-962-5524 if you have any questions or comments regarding this report.

Sincerely,

LT ENVIRONMENTAL, INC.

A handwritten signature in black ink, appearing to read "Jeremy Pike".

Jeremy Pike  
Staff Geologist

A handwritten signature in black ink, appearing to read "Chris Roy".

Chris Roy  
Senior Environmental scientist

## Attachments:

- |              |  |
|--------------|--|
| Figure 1     | Site Location Map                        |
| Figure 2     | Remediation System Layout                |
| Figure 3     | Groundwater Elevation Map                |
| Figure 4     | Groundwater Analytical Results           |
| Table 1      | Groundwater Analytical Results           |
| Attachment 1 | Laboratory Groundwater Analytical Report |



## FIGURES

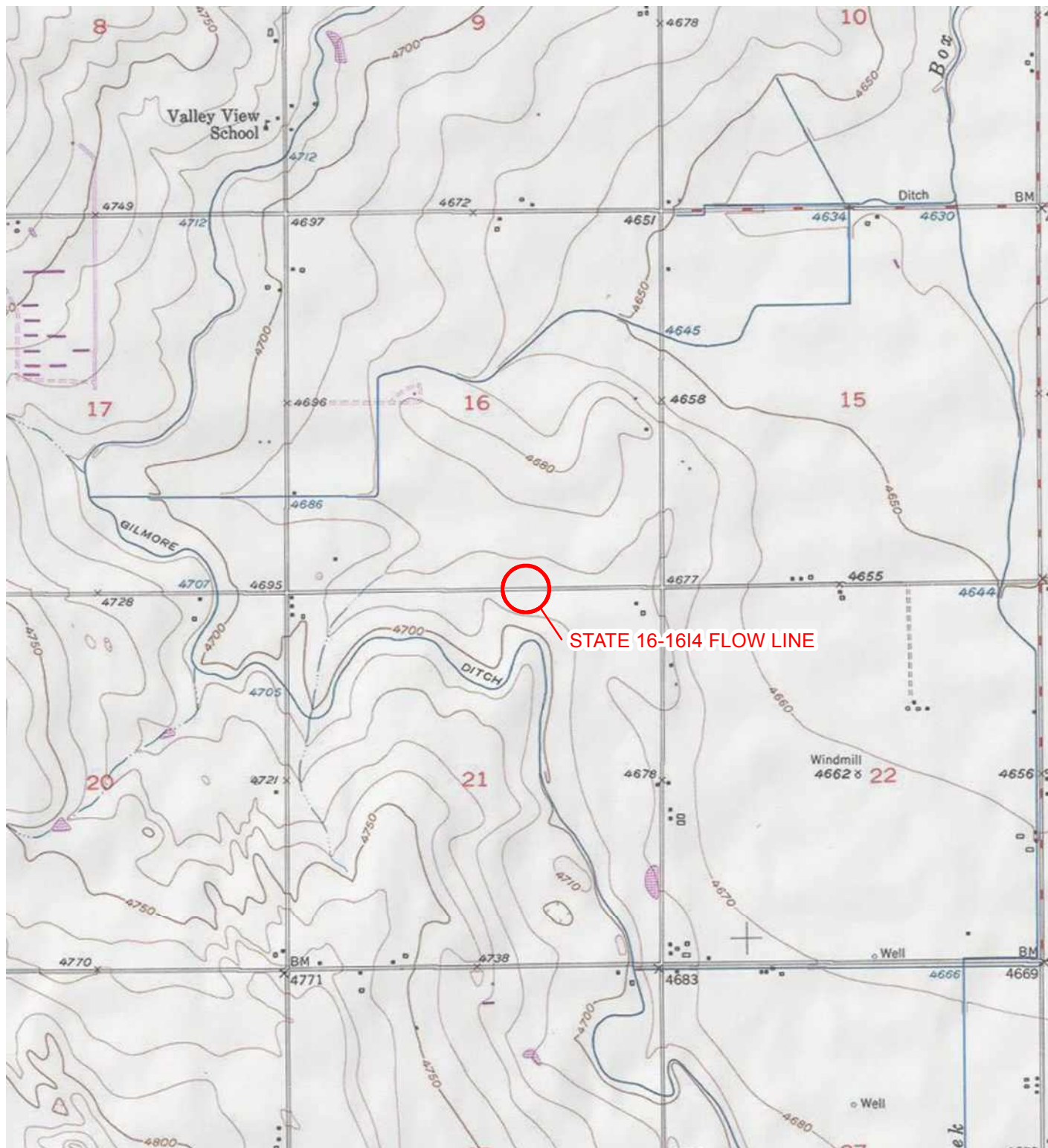


IMAGE COURTESY OF ESRI/USGS

# LEGEND

○ SITE LOCATION

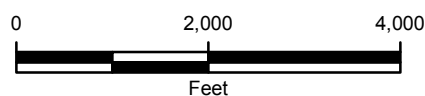
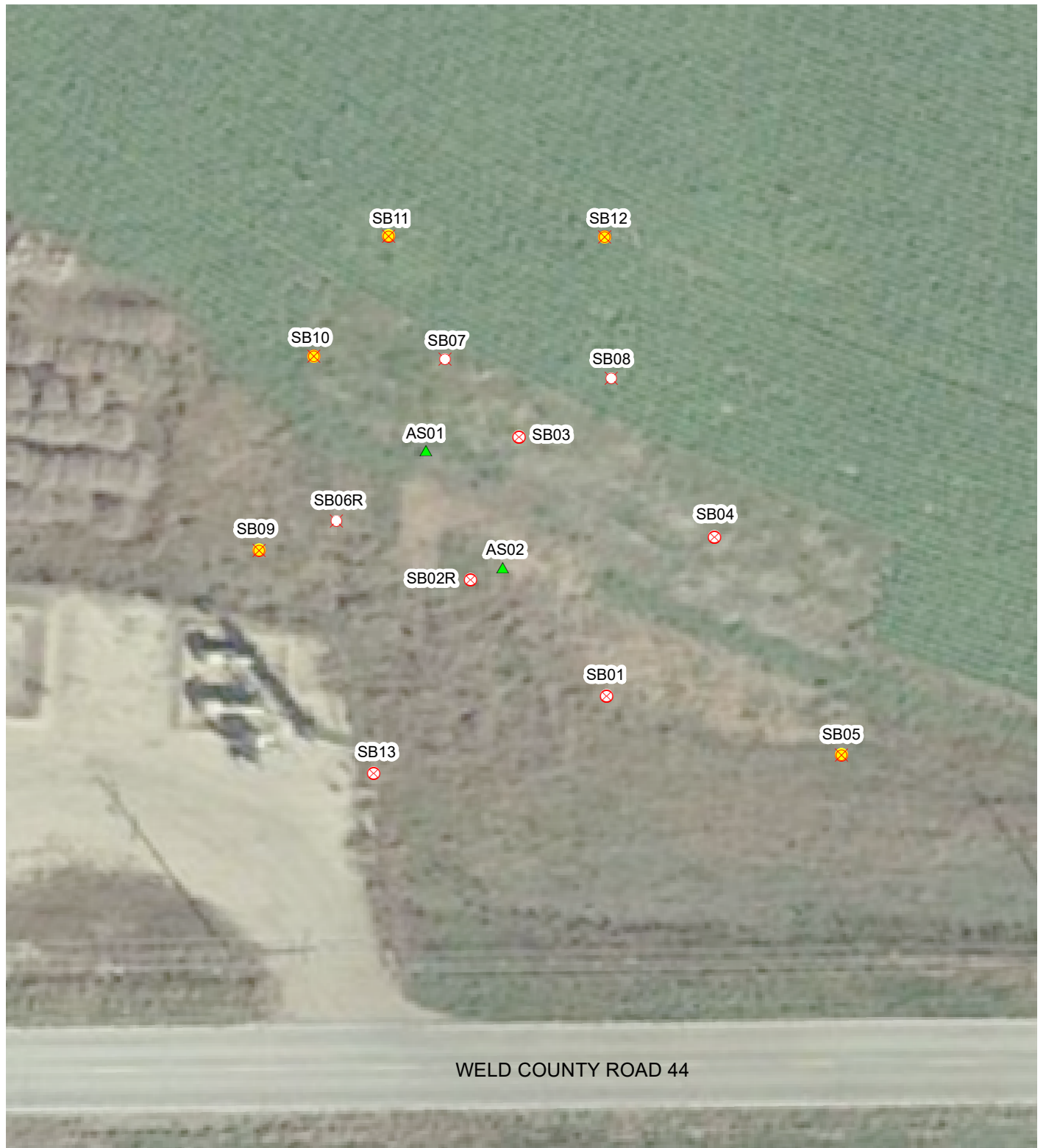


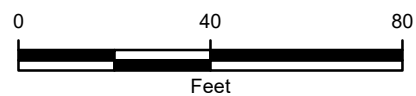
FIGURE 1  
SITE LOCATION MAP STATE  
16-1614 FLOW LINE  
SWSE SEC 16-T4N-R64W  
WELD COUNTY, COLORADO  
NOBLE ENERGY, INC.





# LEGEND

- ⊗ MONITORING WELL
- ⊗ MONITORING WELL REMOVED FROM MONITORING PROGRAM
- ⊗ DESTROYED MONITORING WELL
- ▲ AIR SPARGING WELL (AS)



**FIGURE 2**  
**REMEDIATION SYSTEM LAYOUT**  
**STATE 16-1614 FLOW LINE**  
**SWSE SEC 16-T4N-R64W**  
**WELD COUNTY, COLORADO**  
**NOBLE ENERGY, INC.**



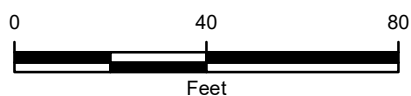


# LEGEND

- ⊗ MONITORING WELL
- ⊗ MONITORING WELL REMOVED FROM MONITORING PROGRAM
- ⊗ DESTROYED MONITORING WELL 2018
- ↑ CALCULATED GROUNDWATER FLOW DIRECTION
- FLOW LINE
- - - EXCAVATION EXTENT
- RELATIVE GROUNDWATER ELEVATION CONTOUR  
CONTOUR INTERVAL = 0.50 FEET  
GRADIENT = 0.003 FEET/FOOT  
GROUNDWATER ELEVATIONS WERE MEASURED  
ON JANUARY 8, 2018

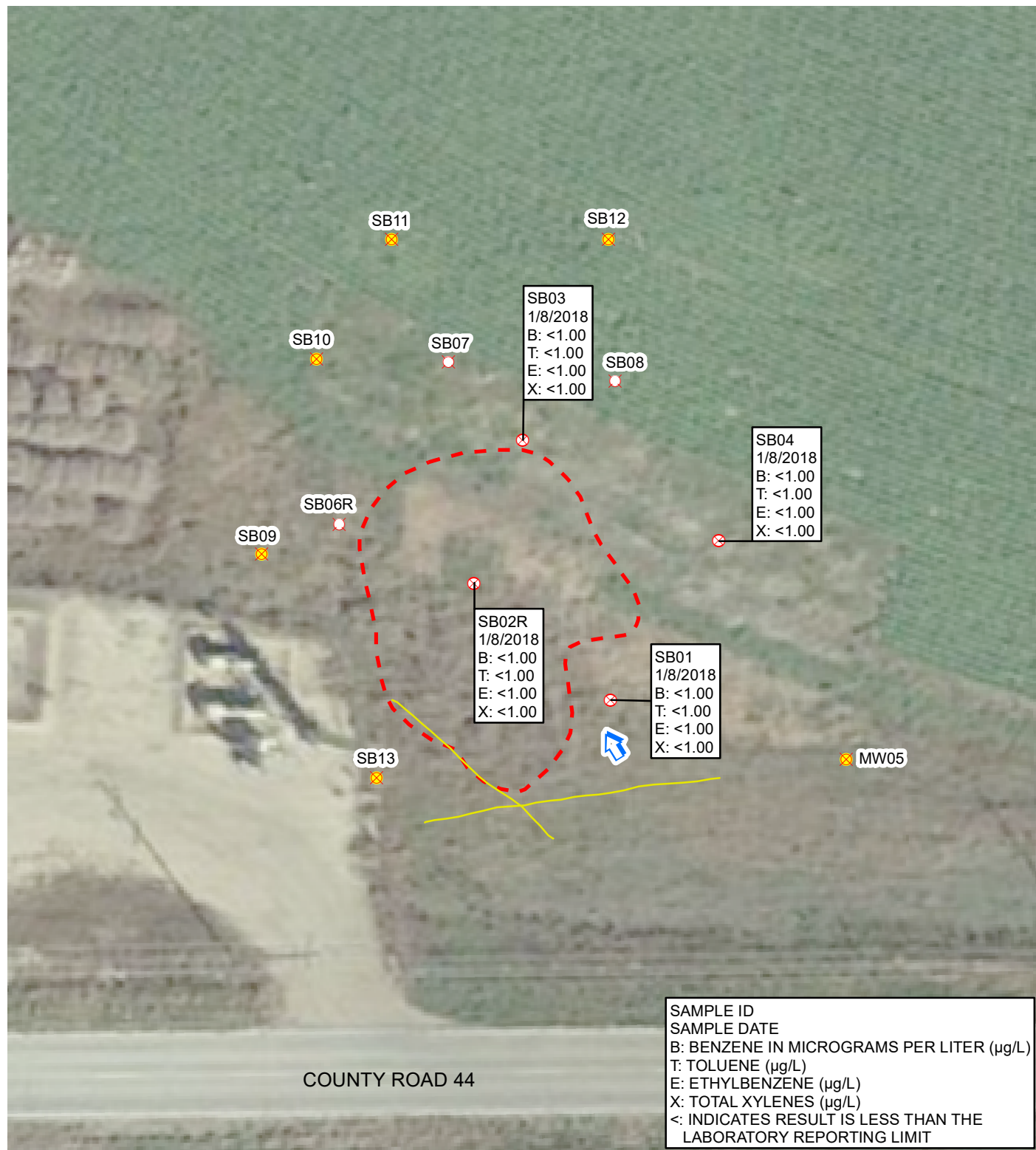
COUNTY ROAD 44

IMAGE COURTESY OF GOOGLE EARTH 2017



**FIGURE 3**  
GROUNDWATER ELEVATION MAP  
STATE 16-16I4 FLOW LINE  
SWSE SEC 16-T4N-R64W  
WELD COUNTY, COLORADO  
**NOBLE ENERGY, INC.**





## TABLES

**TABLE 1**  
**GROUNDWATER ANALYTICAL RESULTS**

**STATE 16-1614 FLOW LINE**  
**COGCC REMEDIATION #8264**  
**WELD COUNTY, COLORADO**  
**NOBLE ENERGY, INC.**

Monitoring Well	Date	Depth to Water (feet btoc)	Groundwater Elevation * (feet AMSL)	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Total Xylenes (µg/L)
SB01	1/29/2014	6.05	90.25	<4.0	<4.0	<4.0	<4.0
	4/24/2014	6.23	90.07	<1.0	<1.0	<1.0	<1.0
	7/21/2014	5.75	4,677.88	<1.0	<1.0	<1.0	<1.0
	10/16/2014	6.10	4,677.53	<1.0	<1.0	<1.0	<1.0
	1/21/2015	6.15	4,677.48	<1.0	<1.0	<1.0	<1.0
	4/9/2015	5.85	4,677.78	<1.0	<1.0	<1.0	<1.0
	7/29/2015	5.30	4,678.33	<1.0	<1.0	<1.0	<1.0
	11/5/2015	5.07	4,678.56	<1.0	<1.0	<1.0	<1.0
	1/28/2016	3.35	4,680.28	<1.0	<1.0	<1.0	<1.0
	4/13/2016	5.42	4,678.21	<1.0	<1.0	<1.0	<1.0
	7/6/2016	4.34	4,679.29	<1.00	<1.00	<1.00	<1.00
	10/4/2016	4.83	4,678.80	<1.00	<1.00	<1.00	<1.00
	1/9/2017	5.30	4,678.33	<1.00	<1.00	<1.00	<1.00
	4/27/2017	5.78	4,677.85	<1.00	<1.00	<1.00	<1.00
	8/4/2017	5.18	4,678.45	<1.00	<1.00	<1.00	<1.00
	10/5/2017	4.19	4,679.44	<1.00	<1.00	<1.00	<1.00
	1/8/2018	5.30	4,678.33	<1.00	<1.00	<1.00	<1.00
SB02	1/29/2014	5.75	90.23	<b>109</b>	172	14.6	155
	4/24/2014	5.85	90.13	<b>444</b>	6.7	43.1	352
	7/21/2014	5.80	4,677.42	<b>500</b>	<4.0	76.0	230
	10/16/2014	6.00	4,677.22	<b>580</b>	13.9	89.2	265
	1/21/2015	5.95	4,677.27	<b>248</b>	<10.0	54.9	200
	4/9/2015	5.54	4,677.68	<b>246</b>	2.2	78.5	288
	7/29/2015	5.14	4,678.08	<b>168</b>	<4.0	53.1	195
	11/5/2015	--	--	No sample - monitoring well destroyed			
SB02R	4/13/2016	5.45	4,677.77	<b>38.5</b>	<1.0	<1.0	<1.0
	7/6/2016	4.31	4,678.91	<b>61.2</b>	<1.00	<1.00	<1.00
	10/4/2016	4.70	4,678.52	3.68	<1.00	<1.00	<1.00
	1/9/2017	5.10	4,678.12	1.43	<1.00	<1.00	<1.00
	4/27/2017	5.73	4,677.49	3.28	<1.00	<1.00	<1.00
	8/4/2017	5.12	4,678.10	<1.00	<1.00	<1.00	<1.00
	10/5/2017	4.11	4,679.11	<1.00	<1.00	<1.00	<1.00
	1/8/2018	5.07	4,678.15	<1.00	<1.00	<1.00	<1.00

**TABLE 1**  
**GROUNDWATER ANALYTICAL RESULTS**

**STATE 16-1614 FLOW LINE**  
**COGCC REMEDIATION #8264**  
**WELD COUNTY, COLORADO**  
**NOBLE ENERGY, INC.**

Monitoring Well	Date	Depth to Water (feet btoc)	Groundwater Elevation * (feet AMSL)	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Total Xylenes (µg/L)
SB03	1/29/2014	5.45	90.45	<b>262</b>	<4.0	<4.0	9.4
	4/24/2014	6.18	89.72	<b>53.7</b>	<2.0	<2.0	<2.0
	7/21/2014	6.00	4,677.17	<b>194</b>	<1.0	5.7	<1.0
	10/16/2014	6.25	4,676.92	<b>35.3</b>	<1.0	<1.0	<1.0
	1/21/2015	6.35	4,676.82	1.5	<1.0	<1.0	<1.0
	4/9/2015	7.50	4,675.67	<1.0	<1.0	<1.0	<1.0
	7/29/2015	5.49	4,677.68	1.3	<1.0	<1.0	<1.0
	11/5/2015	--	--	No sample - monitoring well under water			
	1/28/2016	2.90	4,680.33	<1.0	<1.0	<1.0	<1.0
	4/13/2016	5.59	4,677.64	<b>34.3</b>	<1.0	<1.0	<1.0
	7/6/2016	4.35	4,678.88	<1.00	<1.00	<1.00	<1.00
	10/4/2016	4.80	4,678.43	<1.00	<1.00	<1.00	<1.00
	1/9/2017	5.19	4,678.04	<1.00	<1.00	<1.00	<1.00
	4/27/2017	5.93	4,677.30	<1.00	<1.00	<1.00	<1.00
	8/4/2017	5.35	4,677.88	<1.00	<1.00	<1.00	<1.00
	10/5/2017	4.31	4,678.92	<1.00	<1.00	<1.00	<1.00
	1/8/2018	5.10	4,678.13	<1.00	<1.00	<1.00	<1.00
SB04	1/29/2014	6.06	90.22	<4.0	<4.0	<4.0	<4.0
	4/24/2014	6.00	90.28	<1.0	<1.0	<1.0	<1.0
	7/28/2014	5.91	4,677.34	<1.0	<1.0	<1.0	<1.0
	10/16/2014	6.33	4,676.92	<1.0	<1.0	<1.0	<1.0
	1/21/2015	6.36	4,676.89	<1.0	<1.0	<1.0	<1.0
	4/9/2015	5.64	4,677.61	<1.0	<1.0	<1.0	<1.0
	7/29/2015	5.22	4,678.03	<1.0	<1.0	<1.0	<1.0
	11/5/2015	4.90	4,678.35	<1.0	<1.0	<1.0	<1.0
	1/28/2016	3.00	4,680.25	<1.0	<1.0	<1.0	<1.0
	4/13/2016	5.32	4,677.93	<1.0	<1.0	<1.0	<1.0
	7/6/2016	4.23	4,679.02	<1.00	<1.00	<1.00	<1.00
	10/4/2016	4.65	4,678.60	<1.00	<1.00	<1.00	<1.00
	1/9/2017	5.10	4,678.15	<1.00	<1.00	<1.00	<1.00
	4/27/2017	5.68	4,677.57	<1.00	<1.00	<1.00	<1.00
	8/4/2017	5.09	4,678.16	<1.00	<1.00	<1.00	<1.00
	10/5/2017	4.12	4,679.13	<1.00	<1.00	<1.00	<1.00
	1/8/2018	5.00	4,678.25	<1.00	<1.00	<1.00	<1.00

**TABLE 1**  
**GROUNDWATER ANALYTICAL RESULTS**

**STATE 16-1614 FLOW LINE**  
**COGCC REMEDIATION #8264**  
**WELD COUNTY, COLORADO**  
**NOBLE ENERGY, INC.**

Monitoring Well	Date	Depth to Water (feet btoc)	Groundwater Elevation * (feet AMSL)	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Total Xylenes (µg/L)
SB05	1/29/2014	5.68	90.64	<4.0	<4.0	<4.0	<4.0
	4/24/2014	5.92	90.40	<1.0	<1.0	<1.0	<1.0
	7/28/2014	5.66	4,677.93	<1.0	<1.0	<1.0	<1.0
	10/16/2014	5.96	4,677.63	<1.0	<1.0	<1.0	<1.0
	1/21/2015	5.96	4,677.63	<1.0	<1.0	<1.0	<1.0
	4/9/2015	5.73	4,677.86	<1.0	<1.0	<1.0	<1.0
	7/29/2015	--	--	Removed from monitoring program			
SB06	3/19/2014	5.19	NM	<b>33.6</b>	<4.0	<4.0	<4.0
	4/24/2014	6.21	NM	<b>180</b>	<1.0	<1.0	6.4
	7/21/2014	5.92	4,677.35	<b>159</b>	<1.0	6.8	<1.0
	10/16/2014	6.30	4,676.97	<1.0	<1.0	<1.0	<1.0
	1/21/2015	6.31	4,676.96	<1.0	<1.0	<1.0	<1.0
	4/9/2015	5.80	4,677.47	3.9	<1.0	<1.0	<1.0
	7/29/2015	5.51	4,677.76	<1.0	<1.0	<1.0	<1.0
	11/5/2015	--	--	No sample - monitoring well destroyed			
SB06R	4/13/2016	5.48	4,677.79	3.2	<1.0	<1.0	<1.0
	7/6/2016	4.38	4,678.89	<1.00	<1.00	<1.00	<1.00
	10/4/2016	4.70	4,678.57	<1.00	<1.00	<1.00	<1.00
	1/9/2017	5.15	4,678.12	<1.00	<1.00	<1.00	<1.00
	4/27/2017	5.84	4,677.43	<1.00	<1.00	<1.00	<1.00
	8/4/2017	5.27	4,678.00	<1.00	<1.00	<1.00	<1.00
	10/5/2017	4.28	4,678.99	<1.00	<1.00	<1.00	<1.00
	1/8/2018	--	--	No sample - monitoring well destroyed			
SB07	3/19/2014	5.20	NM	<b>245</b>	<4.0	41.8	<4.0
	4/24/2014	6.40	NM	<b>228</b>	<2.0	62.7	409
	7/28/2014	6.00	4,677.10	1.5	<1.0	36.6	<1.0
	10/16/2014	6.48	4,676.62	1.4	<1.0	<1.0	<1.0
	1/21/2015	6.23	4,676.87	<1.0	<1.0	<1.0	<1.0
	4/9/2015	5.50	4,677.60	<1.0	<1.0	<1.0	<1.0
	7/29/2015	5.80	4,677.30	<1.0	<1.0	<1.0	<1.0
	11/5/2015	5.10	4,678.00	<1.0	<1.0	<1.0	<1.0
	1/28/2016	2.92	4,680.18	<1.0	<1.0	<1.0	<1.0
	4/13/2016	5.87	4,677.23	<1.0	<1.0	<1.0	<1.0
	7/6/2016	4.51	4,678.59	<1.00	<1.00	<1.00	<1.00

**TABLE 1**  
**GROUNDWATER ANALYTICAL RESULTS**

**STATE 16-1614 FLOW LINE**  
**COGCC REMEDIATION #8264**  
**WELD COUNTY, COLORADO**  
**NOBLE ENERGY, INC.**

Monitoring Well	Date	Depth to Water (feet btoc)	Groundwater Elevation * (feet AMSL)	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Total Xylenes (µg/L)
SB07	10/4/2016	4.90	4,678.20	<1.00	<1.00	<1.00	<1.00
	1/9/2017	5.30	4,677.80	<1.00	<1.00	<1.00	<1.00
	4/27/2017	6.20	4,676.90	<1.00	<1.00	<1.00	<1.00
	8/4/2017	5.68	4,677.42	<1.00	<1.00	<1.00	<1.00
	10/5/2017	5.66	4,677.44	<1.00	<1.00	<1.00	<1.00
	1/8/2018	--	--	No sample - monitoring well destroyed			
SB08	3/19/2014	5.39	NM	<4.0	<4.0	<4.0	<4.0
	4/24/2014	6.60	NM	<1.0	<1.0	<1.0	<1.0
	7/28/2014	6.21	4,677.12	<1.0	<1.0	<1.0	<1.0
	10/16/2014	6.68	4,676.65	<b>12.3</b>	<1.0	<1.0	<1.0
	1/21/2015	6.71	4,676.62	<1.0	<1.0	<1.0	<1.0
	4/9/2015	6.14	4,677.19	<1.0	<1.0	<1.0	<1.0
	7/29/2015	5.91	4,677.42	<1.0	<1.0	<1.0	<1.0
	11/5/2015	5.30	4,678.03	<1.0	<1.0	<1.0	<1.0
	1/28/2016	3.20	4,680.13	<1.0	<1.0	<1.0	<1.0
	4/13/2016	5.97	4,677.36	<1.0	<1.0	<1.0	<1.0
	7/6/2016	4.50	4,678.83	<1.00	<1.00	<1.00	<1.00
	10/4/2016	5.02	4,678.31	<1.00	<1.00	<1.00	<1.00
	1/9/2017	5.50	4,677.83	<1.00	<1.00	<1.00	<1.00
	4/27/2017	6.29	4,677.04	<1.00	<1.00	<1.00	<1.00
	8/4/2017	5.59	4,677.74	<1.00	<1.00	<1.00	<1.00
	10/5/2017	4.58	4,678.75	<1.00	<1.00	<1.00	<1.00
	1/8/2018	--	--	No sample - monitoring well destroyed			
SB09	4/24/2014	6.15	NM	<1.0	<1.0	<1.0	<1.0
	7/21/2014	5.85	4,677.45	<1.0	<1.0	<1.0	<1.0
	10/16/2014	6.48	4,676.82	<1.0	<1.0	<1.0	<1.0
	1/21/2015	6.51	4,676.79	<1.0	<1.0	<1.0	<1.0
	4/9/2015	5.75	4,677.55	<1.0	<1.0	<1.0	<1.0
	7/29/2015	--	--	Removed from monitoring program			
SB10	4/24/2014	6.43	NM	<1.0	<1.0	<1.0	<1.0
	7/21/2014	5.94	4,677.12	<1.0	<1.0	<1.0	<1.0
	10/16/2014	6.60	4,676.46	<1.0	<1.0	<1.0	<1.0
	1/21/2015	6.69	4,676.37	<1.0	<1.0	<1.0	<1.0
	4/9/2015	5.88	4,677.18	<1.0	<1.0	<1.0	<1.0
	7/29/2015	--	--	Removed from monitoring program			

**TABLE 1**  
**GROUNDWATER ANALYTICAL RESULTS**

**STATE 16-1614 FLOW LINE**  
**COGCC REMEDIATION #8264**  
**WELD COUNTY, COLORADO**  
**NOBLE ENERGY, INC.**

Monitoring Well	Date	Depth to Water (feet btoc)	Groundwater Elevation * (feet AMSL)	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Total Xylenes (µg/L)
SB11	4/24/2014	6.61	NM	<b>6.0</b>	<1.0	<1.0	6.0
	7/21/2014	5.96	4,676.92	<1.0	<1.0	<1.0	47.2
	10/16/2014	6.85	4,676.03	<1.0	<1.0	<1.0	7.0
	1/21/2015	6.90	4,675.98	<1.0	<1.0	<1.0	<1.0
	4/9/2015	6.02	4,676.86	<1.0	<1.0	<1.0	<1.0
	7/29/2015	--	--	Removed from monitoring program			
SB12	4/24/2014	6.40	NM	<1.0	<1.0	<1.0	<1.0
	7/21/2014	6.02	4,676.32	<1.0	<1.0	<1.0	<1.0
	10/16/2014	6.80	4,676.70	<1.0	<1.0	<1.0	<1.0
	1/21/2015	6.82	4,675.92	<1.0	<1.0	<1.0	<1.0
	4/9/2015	5.89	4,675.90	<1.0	<1.0	<1.0	<1.0
	7/29/2015	--	--	Removed from monitoring program			
SB13	10/16/2014	8.18	4,677.89	<1.0	<1.0	<1.0	<1.0
	1/21/2015	8.25	4,677.82	<1.0	<1.0	<1.0	<1.0
	4/9/2015	8.31	4,677.76	<1.0	<1.0	<1.0	<1.0
	7/29/2015	--	--	Removed from monitoring program			
<b>CDPHE WQCC Reg 41</b>				<b>5.0</b>	<b>560</b>	<b>700</b>	<b>1,400</b>

**NOTES:**

Remediation system shutdown occurred on 4/13/17 to begin groundwater monitoring under static conditions

AMSL - above mean sea level

btoc - below top of casing

µg/L - micrograms per liter

< - indicates result is less than the stated laboratory reporting limit

NM - not measured

Benzene, toluene, ethylbenzene, and total xylenes analyzed by EPA Method 8260C

**BOLD** indicates result exceeds the applicable standard

CDPHE WQCC Reg 41 - Colorado Department of Public Health and Environment-Water Quality Control Commission

Regulation 41 - The Basic Standards for Ground Water

\* - groundwater elevations prior to the July 2014 monitoring event were relative to a 100-foot benchmark

**ATTACHMENT 1**  
**LABORATORY GROUNDWATER ANALYTICAL REPORT**





January 15, 2018

LT Environmental, Inc.

Jeremy Pike

4600 West 60th Avenue

Arvada

CO 80003

**Project Name - Noble - State 16-1614**

**Project Number - 008313110**

Attached are your analytical results for Noble - State 16-1614 received by Origins Laboratory, Inc. January 08, 2018. This project is associated with Origins project number Y801098-01.

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

Jeremy Pike  
Project Number: 008313110  
Project: Noble - State 16-1614

## CROSS REFERENCE REPORT

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
SB01	Y801098-01	Water	January 8, 2018 13:25	01/08/2018 15:15
SB02R	Y801098-02	Water	January 8, 2018 14:08	01/08/2018 15:15
SB03	Y801098-03	Water	January 8, 2018 13:54	01/08/2018 15:15
SB04	Y801098-04	Water	January 8, 2018 13:43	01/08/2018 15:15
SB06R	Y801098-05	Water	January 8, 2018 14:21	01/08/2018 15:15

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.*

Jeremy Pike  
Project Number: 008313110  
Project: Noble - State 16-1614

# ORIGINS

## LABORATORY, INC

www.originslaboratory.com




Y201098

page 1 of 1

Client: LT Environmental, Inc.  
Address: 4600 West 60th Ave, Arvada, CO  
Telephone Number: 303-433-9788  
Email Address: Noble Remediation Team

Project Manager: Jeremy Pike  
Project Name: State 16-1614  
Project Number: 008313110  
Samples Collected By: Gloria Thompson

Invoice Jacob Evans

Sample ID Description	Date Sampled	Time Sampled	# of Containers	Preservative				Matrix				Analysis		Sample Instructions
				Unpreserved	HCl	HNO <sub>3</sub>	Other	Groundwater	Soil	Air Summa #	Other			
SB001	1/8/18	1325	3	X	X	X		X				BTEX	Lab filter all	1
SB002	1/8/18	1408	3	X	X	X		X						2
SB003	1/8/18	1354	3	X	X	X		X						3
SB004	1/8/18	1343	3	X	X	X		X						4
SB005	1/8/18	1421	3	X	X	X		X						5
														6
														7
														8
														9
														10
Relinquished By: 	Date: 1/8/18	Time: 1515		Received By: 								Date: 1-8-18	Time: 1515	Turnaround Time: Same Day <input type="checkbox"/> 24 Hr <input type="checkbox"/> 48 Hr <input type="checkbox"/> 72 Hr <input type="checkbox"/> Standard <input checked="" type="checkbox"/>
Relinquished By: 	Date:	Time:		Received By:								Date:	Time:	

Origins Laboratory, Inc.

Jeff Pellgrini

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

Jeremy Pike  
Project Number: 008313110  
Project: Noble - State 16-1614

Origins Laboratory

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

## Sample Receipt Checklist

Origins Work Order: 4801098

Client: LTE

Client Project ID: Noble - State

Checklist Completed by: Dan Lu

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

Date/time completed: 1-9-13

Airbill #: NA

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

Cooler Number/Temperature: 1 / 4.6 °C 1 /     °C 1 /     °C (Describe)

Thermometer ID: TUC3

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> ?	<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 <sup>(1)</sup> ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Was adequate sample volume provided <sup>(1)</sup> ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Are short holding time analytes or samples with HTs due within 48 hours present <sup>(1)</sup> ?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Is a chain-of-custody (COC) present and filled out completely <sup>(1)</sup> ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Does the COC agree with the number and type of sample bottles received <sup>(1)</sup> ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Do the sample IDs on the bottle labels match the COC <sup>(1)</sup> ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Is the COC properly relinquished by the client with date and time recorded <sup>(1)</sup> ?	<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 checked="" type="checkbox"/>	<input type="checkbox"/>	
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)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
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]

1-9-13  
Date/Time Reviewed

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

Jeremy Pike  
Project Number: 008313110  
Project: Noble - State 16-1614

SB01

1/8/2018 1:25:00PM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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Origins Laboratory, Inc.  
Y801098-01 (Water)

BTEX by EPA 8260C

Benzene	ND	1.00	ug/L	1	B8A1007	01/10/2018	01/11/2018	U
Toluene	ND	1.00	"	"	"	"	"	U
Ethylbenzene	ND	1.00	"	"	"	"	"	U
Xylenes, total	ND	1.00	"	"	"	"	"	U

Surrogate: 1,2-Dichloroethane-d4	99.4 %	84-121	"	"	"
Surrogate: Toluene-d8	98.6 %	85-115	"	"	"
Surrogate: 4-Bromofluorobenzene	97.7 %	84-114	"	"	"

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

Jeremy Pike  
Project Number: 008313110  
Project: Noble - State 16-1614

SB02R  
1/8/2018 2:08:00PM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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Origins Laboratory, Inc.  
Y801098-02 (Water)

## BTEX by EPA 8260C

Benzene	ND	1.00	ug/L	1	B8A1007	01/10/2018	01/11/2018	U
Toluene	ND	1.00	"	"	"	"	"	U
Ethylbenzene	ND	1.00	"	"	"	"	"	U
Xylenes, total	ND	1.00	"	"	"	"	"	U

Surrogate: 1,2-Dichloroethane-d4  
Surrogate: Toluene-d8  
Surrogate: 4-Bromofluorobenzene

101 % 84-121  
98.7 % 85-115  
101 % 84-114

" " "  
" " "  
" " "

Origins Laboratory, Inc.



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

Jeremy Pike  
Project Number: 008313110  
Project: Noble - State 16-1614

SB03

1/8/2018 1:54:00PM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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Origins Laboratory, Inc.  
Y801098-03 (Water)

BTEX by EPA 8260C

Benzene	ND	1.00	ug/L	1	B8A1007	01/10/2018	01/11/2018	U
Toluene	ND	1.00	"	"	"	"	"	U
Ethylbenzene	ND	1.00	"	"	"	"	"	U
Xylenes, total	ND	1.00	"	"	"	"	"	U

Surrogate: 1,2-Dichloroethane-d4	100 %	84-121	"	"	"
Surrogate: Toluene-d8	99.6 %	85-115	"	"	"
Surrogate: 4-Bromofluorobenzene	99.2 %	84-114	"	"	"

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

Jeremy Pike  
Project Number: 008313110  
Project: Noble - State 16-1614

**SB04**

**1/8/2018 1:43:00PM**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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**Origins Laboratory, Inc.**  
**Y801098-04 (Water)**

**BTEX by EPA 8260C**

Benzene	ND	1.00	ug/L	1	B8A1007	01/10/2018	01/11/2018	U
Toluene	ND	1.00	"	"	"	"	"	U
Ethylbenzene	ND	1.00	"	"	"	"	"	U
Xylenes, total	ND	1.00	"	"	"	"	"	U

Surrogate: 1,2-Dichloroethane-d4	102 %	84-121	"	"	"
Surrogate: Toluene-d8	99.1 %	85-115	"	"	"
Surrogate: 4-Bromofluorobenzene	99.9 %	84-114	"	"	"

Origins Laboratory, Inc.



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

Jeremy Pike  
Project Number: 008313110  
Project: Noble - State 16-1614

SB06R

1/8/2018 2:21:00PM

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Notes
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Origins Laboratory, Inc.  
Y801098-05 (Water)

## BTEX by EPA 8260C

Benzene	ND	1.00	ug/L	1	B8A1007	01/10/2018	01/11/2018	U
Toluene	ND	1.00	"	"	"	"	"	U
Ethylbenzene	ND	1.00	"	"	"	"	"	U
Xylenes, total	ND	1.00	"	"	"	"	"	U

Surrogate: 1,2-Dichloroethane-d4	101 %	84-121	"	"	"
Surrogate: Toluene-d8	99.7 %	85-115	"	"	"
Surrogate: 4-Bromofluorobenzene	97.0 %	84-114	"	"	"

Origins Laboratory, Inc.



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

Jeremy Pike  
Project Number: 008313110  
Project: Noble - State 16-1614

**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 B8A1007 - EPA 5030B (Water)										
Blank (B8A1007-BLK1)					Prepared: 01/10/2018 Analyzed: 01/11/2018					
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	64		"	62.5	103		84-121			
Surrogate: Toluene-d8	62		"	62.5	99.2		85-115			
Surrogate: 4-Bromofluorobenzene	61		"	62.5	97.6		84-114			

Origins Laboratory, Inc.



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

Jeremy Pike  
Project Number: 008313110  
Project: Noble - State 16-1614

**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
<b>Batch B8A1007 - EPA 5030B (Water)</b>										
<b>Blank (B8A1007-BLK2)</b>					Prepared: 01/10/2018 Analyzed: 01/11/2018					
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	62		"	62.5		99.9	84-121			
Surrogate: Toluene-d8	62		"	62.5		99.4	85-115			
Surrogate: 4-Bromofluorobenzene	61		"	62.5		97.3	84-114			

Origins Laboratory, Inc.



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

Jeremy Pike  
Project Number: 008313110  
Project: Noble - State 16-1614

**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
<b>Batch B8A1007 - EPA 5030B (Water)</b>										
<b>LCS (B8A1007-BS1)</b>					Prepared: 01/10/2018 Analyzed: 01/11/2018					
Benzene	50.7	1.00	ug/L	50.0		101	73.3-129			
Toluene	49.6	1.00	"	50.0		99.3	76.2-123			
Ethylbenzene	49.7	1.00	"	50.0		99.5	73.6-130			
m,p-Xylene	101	2.00	"	100		101	76.1-126			
o-Xylene	52.6	1.00	"	50.0		105	76.6-124			
Surrogate: 1,2-Dichloroethane-d4	57		"	62.5		91.1	84-121			
Surrogate: Toluene-d8	61		"	62.5		98.3	85-115			
Surrogate: 4-Bromofluorobenzene	63		"	62.5		101	84-114			

Origins Laboratory, Inc.



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

Jeremy Pike  
Project Number: 008313110  
Project: Noble - State 16-1614

**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 B8A1007 - EPA 5030B (Water)**

**LCS (B8A1007-BS2)**

Prepared: 01/10/2018 Analyzed: 01/11/2018

Benzene	59.3	1.00	ug/L	50.0	119	73.3-129
Toluene	57.7	1.00	"	50.0	115	76.2-123
Ethylbenzene	59.5	1.00	"	50.0	119	73.6-130
m,p-Xylene	119	2.00	"	100	119	76.1-126
o-Xylene	58.1	1.00	"	50.0	116	76.6-124
Surrogate: 1,2-Dichloroethane-d4	66		"	62.5	105	84-121
Surrogate: Toluene-d8	61		"	62.5	98.0	85-115
Surrogate: 4-Bromofluorobenzene	63		"	62.5	100	84-114

Origins Laboratory, Inc.



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

Jeremy Pike  
Project Number: 008313110  
Project: Noble - State 16-1614

**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 B8A1007 - EPA 5030B (Water)**

Matrix Spike (B8A1007-MS1)		Source: Y801096-01			Prepared: 01/10/2018 Analyzed: 01/11/2018					
Benzene	54.4	1.00	ug/L	50.0	ND	109	74-130			
Toluene	54.1	1.00	"	50.0	ND	108	73-131			
Ethylbenzene	54.9	1.00	"	50.0	ND	110	76-132			
m,p-Xylene	110	2.00	"	100	ND	110	69-139			
o-Xylene	55.0	1.00	"	50.0	ND	110	74-131			
Surrogate: 1,2-Dichloroethane-d4	65		"	62.5		104	84-121			
Surrogate: Toluene-d8	63		"	62.5		100	85-115			
Surrogate: 4-Bromofluorobenzene	62		"	62.5		98.7	84-114			

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

Jeremy Pike  
Project Number: 008313110  
Project: Noble - State 16-1614

**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 B8A1007 - EPA 5030B (Water)**

Matrix Spike (B8A1007-MS2)		Source: Y801096-02			Prepared: 01/10/2018 Analyzed: 01/11/2018					
Benzene	58.7	1.00	ug/L	50.0	ND	117	74-130			
Toluene	58.2	1.00	"	50.0	ND	116	73-131			
Ethylbenzene	64.8	1.00	"	50.0	11.7	106	76-132			
m,p-Xylene	136	2.00	"	100	44.7	91.2	69-139			
o-Xylene	66.1	1.00	"	50.0	17.3	97.5	74-131			
Surrogate: 1,2-Dichloroethane-d4	65		"	62.5		104	84-121			
Surrogate: Toluene-d8	62		"	62.5		99.6	85-115			
Surrogate: 4-Bromofluorobenzene	62		"	62.5		100	84-114			

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

Jeremy Pike  
Project Number: 008313110  
Project: Noble - State 16-1614

**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 B8A1007 - EPA 5030B (Water)**

Matrix Spike Dup (B8A1007-MSD1)		Source: Y801096-01			Prepared: 01/10/2018 Analyzed: 01/11/2018					
Benzene	56.1	1.00	ug/L	50.0	ND	112	74-130	3.06	20	
Toluene	55.9	1.00	"	50.0	ND	112	73-131	3.27	20	
Ethylbenzene	58.5	1.00	"	50.0	ND	117	76-132	6.37	20	
m,p-Xylene	116	2.00	"	100	ND	116	69-139	5.55	20	
o-Xylene	57.4	1.00	"	50.0	ND	115	74-131	4.29	20	
Surrogate: 1,2-Dichloroethane-d4	63		"	62.5		102	84-121			
Surrogate: Toluene-d8	62		"	62.5		98.7	85-115			
Surrogate: 4-Bromofluorobenzene	63		"	62.5		100	84-114			

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

Jeremy Pike  
Project Number: 008313110  
Project: Noble - State 16-1614

**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 B8A1007 - EPA 5030B (Water)**

Matrix Spike Dup (B8A1007-MSD2)		Source: Y801096-02			Prepared: 01/10/2018 Analyzed: 01/11/2018					
Benzene	58.2	1.00	ug/L	50.0	ND	116	74-130	0.856	20	
Toluene	58.6	1.00	"	50.0	ND	117	73-131	0.822	20	
Ethylbenzene	64.6	1.00	"	50.0	11.7	106	76-132	0.340	20	
m,p-Xylene	137	2.00	"	100	44.7	91.8	69-139	0.492	20	
o-Xylene	66.4	1.00	"	50.0	17.3	98.1	74-131	0.483	20	
Surrogate: 1,2-Dichloroethane-d4	57		"	62.5		91.1	84-121			
Surrogate: Toluene-d8	63		"	62.5		100	85-115			
Surrogate: 4-Bromofluorobenzene	62		"	62.5		99.4	84-114			

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### 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.

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Jen Pellegrini For Noelle Doyle Mathis, President