CH2M
3120 Highwoods Boulevard
Suite 214
Raleigh, NC 27604
O +1 919 875 4311
F +1 919 875 8491
www.ch2m.com

March 13, 2018

Delivered via FedEx Overnight Delivery

Ms. Bobbi Coleman
South Carolina Department of Health and Environmental Control (SCDHEC)
Assessment Section, UST Management Division
Bureau of Land and Waste Management
2600 Bull Street
Columbia, SC 29201

Subject: **Lewis Drive – Memorandums from Environmental Standards, Inc. certified on January 26, 2018 and March 12, 2018**
Plantation Pipe Line Company
Belton, South Carolina
Site ID #18693, "Kinder Morgan Belton Pipeline Release"

Dear Ms. Coleman,

On behalf of Plantation Pipe Line Company (Plantation), CH2M HILL Engineers, Inc. (CH2M) is submitting the attached certified Memorandums from Environmental Standards, Inc. These memorandums were submitted previously as attachments to reports, but in a meeting with SCDHEC on March 7, 2018 it was requested by SCDHEC they be re-submitted with certification from Environmental Standards, Inc. If you have any questions or concerns, please call me at 919-760-1777, Mr. Scott Powell/CH2M at 678-530-4457, or Mr. Jerry Aycock/Plantation at 770-751-4165.

Regards,
CH2M HILL Engineers, Inc.

William M. Waldron, P.E.
Program Manager

Attachments:

- Two memorandums from Environmental Standards, Inc. with associated certification letters

c: Jerry Aycock, Plantation (Digital, Jerry_Aycock@kindermorgan.com)
Mary Clair Lyons, Esq., Plantation (Digital, Mary_Lyons@kindermorgan.com)
Richard Morton, Esq., Womble Carlyle Sandridge & Rice, PLLC (Digital, rmorton@wcsr.com)
File

ENVIRONMENTAL®
STANDARDS
Setting the Standards for Innovative Environmental Solutions

January 26, 2018

Mr. Scott Powell, PE
Project Engineer
Jacobs
6600 Peachtree Dunwoody Road
400 Embassy Row, Suite 600
Atlanta, GA 30328, USA

Dear Mr. Powell:

Please find attached the MEMORANDUM Regarding the Review of Surface Water Data, dated January 17, 2018, addressed to Mr. Jerry Aycock of KM Products Pipelines SE and to you. I hereby certify that the memorandum, watermarked and secured in portable document format. My signature is affixed to this attached version and the document is locked from further editing.

I attest that the statements in the attached memorandum are true to the best of my knowledge and that the opinions therein are offered by myself, with no influence from others.

Please let me know if you have any questions or need further clarifications.

Sincerely,

David I Thal, CEAC, CQA
Principal Chemist
Environmental Standards
8331 East Walker Springs Lane
Suite 402
Knoxville TN, 37923

cc: Mr. Jerry Aycock, KM Products Pipelines SE
Environmental Standards Files

ENVIRONMENTAL®
STANDARDS
Setting the Standards for Innovative Environmental Solutions

MEMORANDUM

Date: January 17, 2018

To: Mr. Jerry Aycock – KM Products Pipelines SE
Mr. Scott Powell – Jacobs

From: Mr. David Thal CEAC, CQA – Environmental Standards, Inc.

Copy to: File – Environmental Standards, Inc.

Subject: Review of Surface Water Data

Introduction

A release of an estimated 8,800 barrels of gasoline and a small amount of diesel fuel was identified and reported on December 8, 2014. The release was from a sleeve of a 26-inch product pipeline near Lewis Drive, Belton, South Carolina.

The site is located in the pipeline right-of-way between Lewis Drive, a rural two-lane undivided asphalt road, to the east and a hayfield to the west. The location on Lewis Drive is approximately 400 feet to the northwest of Lewis Drive's convergence with West Calhoun Road. (Figure 1)

A variety of source control, removal and other remediation actions were taken, including the installation of monitoring wells, recovery sumps, recovery wells, and recovery trenches. These actions included a recovery trench and recovery wells that were put in place to contain and control transport of contamination to Brown's Creek and an unnamed tributary thereto. Additionally, absorbent and impermeable booms were set up in the tributary itself as a backup measure.

Contamination from the release point is characterized by the chemical profile found in surface water from sampling location SW-12. Volatile organic compounds were detected in a surface water sample collected from sampling location SW-02 during a sampling event conducted on December 14, 2017.

Evaluation

The samples were analyzed by ESC Laboratory Sciences of Mt. Juliet, Tennessee (ESC). The reported data hydrocarbon data were examined to evaluate whether the contaminants were from the same source.

The instrument data for both samples provided from the ESC analyses were reviewed for data quality, and for mass spectral features to determine whether the contaminants inSW-02 could be from the Plantation Pipeline release.

The samples examined are summarized on Table 1:

Table 1 – Sample Summary				
Field Sample ID	Location	Date:Time Collected	Laboratory Report	Laboratory Sample ID
SW-02 -121417	SW-02 (Figure 1)	12/14/17:1430	ESC-L957851	L957851-10
SW-12-121417	SW-12 (Figure 1)	12/14/17:1505	ESC-L957851	L957851-13

A review of the quality control for the two analyses was conducted. The positive and negative controls were reviewed in addition to system monitoring recoveries. Spectral match quality was reviewed through review of the instrument data. All method indices were found to be within acceptance criteria, and support high confidence in the data obtained with regard to qualitative identification, accuracy, and precision.

A comparison of all analytes meeting a spectral match index of 80 or higher is presented in tabular form below (Table 2). In order to compare the profiles, each detected compound concentration was normalized to the sum of all compounds for the sample and was calculated as weight percent of detected compounds. The results are displayed in graphic form in the histogram in Figure 2.

Table 2 – Summary of Volatile Organic Compound Detections		
	Weight Percent	
Detected Compound	SW-02	SW-12
ACETONE	2.0%	0.0%
DI-ISOPROPYL ETHER	11.0%	3.1%
T-AMYL ALCOHOL	24.5%	12.6%
TERT-AMYL METHYL ETHER	3.0%	0.0%
BENZENE	23.5%	12.2%
TOLUENE	10.5%	11.0%
ETHYLBENZENE	1.7%	3.5%
M&P-XYLENE	10.9%	23.8%
O-XYLENE	8.2%	16.1%
ISOPROPYLBENZENE	0.0%	0.2%
4-ETHYLTOLUENE	1.4%	5.6%
N-PROPYLBENZENE	0.2%	0.5%
1,3,5-TRIMETHYLBENZENE	0.0%	2.0%
1,2,4-TRIMETHYLBENZENE	1.7%	6.2%
1,2,3-TRIMETHYLBENZENE	1.0%	2.6%
NAPHTHALENE	0.4%	0.7%

An examination of all mass spectra for discernable peaks of the ESC mass chromatograms for the samples was performed. The compounds that could be identified with good spectral fit above background were used in the table and referenced histogram (Figure 2). The review

confirmed several features of the chemical profiles that indicate that the contaminants at SW-02 are primarily from a different source than those seen in SW-12.

Feature 1: Certain compounds were observed in SW-02 that were not present in SW-12. These include acetone and tertiary amyl methyl ether.

Feature 2: Significant differences were observed in the benzene/toluene ratios between the samples that do not conform to environmental degradation norms. Because the two samples have essentially the same weight percent of toluene, the significant differences in the benzene concentration cannot be attributed to the same source material being environmentally degraded. Had that been the case, the toluene in SW-02 would have also been reduced (though slightly less dramatically than the benzene).

Feature 3: The SW-12 sample had higher weight percentages of alkylated benzenes.

Finally, the overall "shape" of the profiles differ in a manner that indicates different sources. The dramatically higher percentages of di-isopropyl ether, tertiary amyl alcohol, and benzene in the SW-02 and the relatively high xylenes in the SW-12 location further distinguish the sources of contaminants to these two locations.

Conclusions

A technical environmental forensic review of the laboratory data and information available regarding the surface waters from locations SW-02 and SW-12 was conducted. Based upon the GC/MS data it is readily apparent that the chemical profiles differ, and in at least one respect (benzene/toluene ratios) cannot be attributed to migration and degradation.

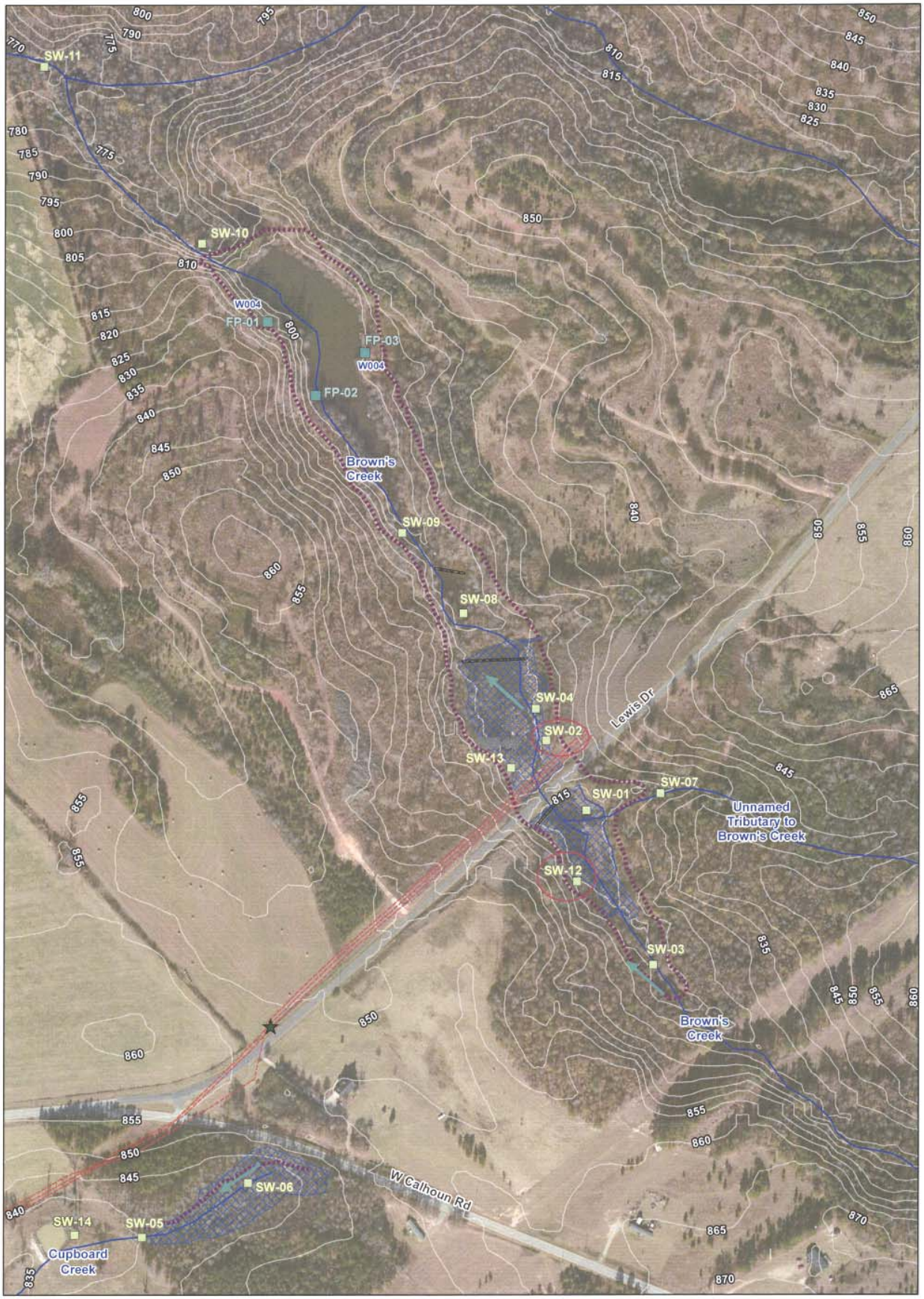
Any questions regarding this review may be directed to David Thal, CEAC, CQA at dthal@envstd.com.

David Thal

Digitally signed by David I Thal
DN: cn=David I Thal, o=Environmental Standards/VSA, ou=Knoxville Office, email=dthal@envstd.com, c=US
Date: 2018.01.26 14:23:53 -05'00'

END OF MEMORANDUM

FIGURE 1 - Lewis Drive Surface Water Sampling Locations



LEGEND

- Release Point
- Surface Water Sampling Location
- Fish Pond Surface Water Sampling Location
- Pipeline
- Inspection Route for Sheen or Distressed Vegetation
- Flow Direction of Creek
- Topographic Contour (5-foot Interval)
- National Hydrography Dataset Stream
- Delineated Wetland
- Beaver Dam

0 250 500
Scale in Feet

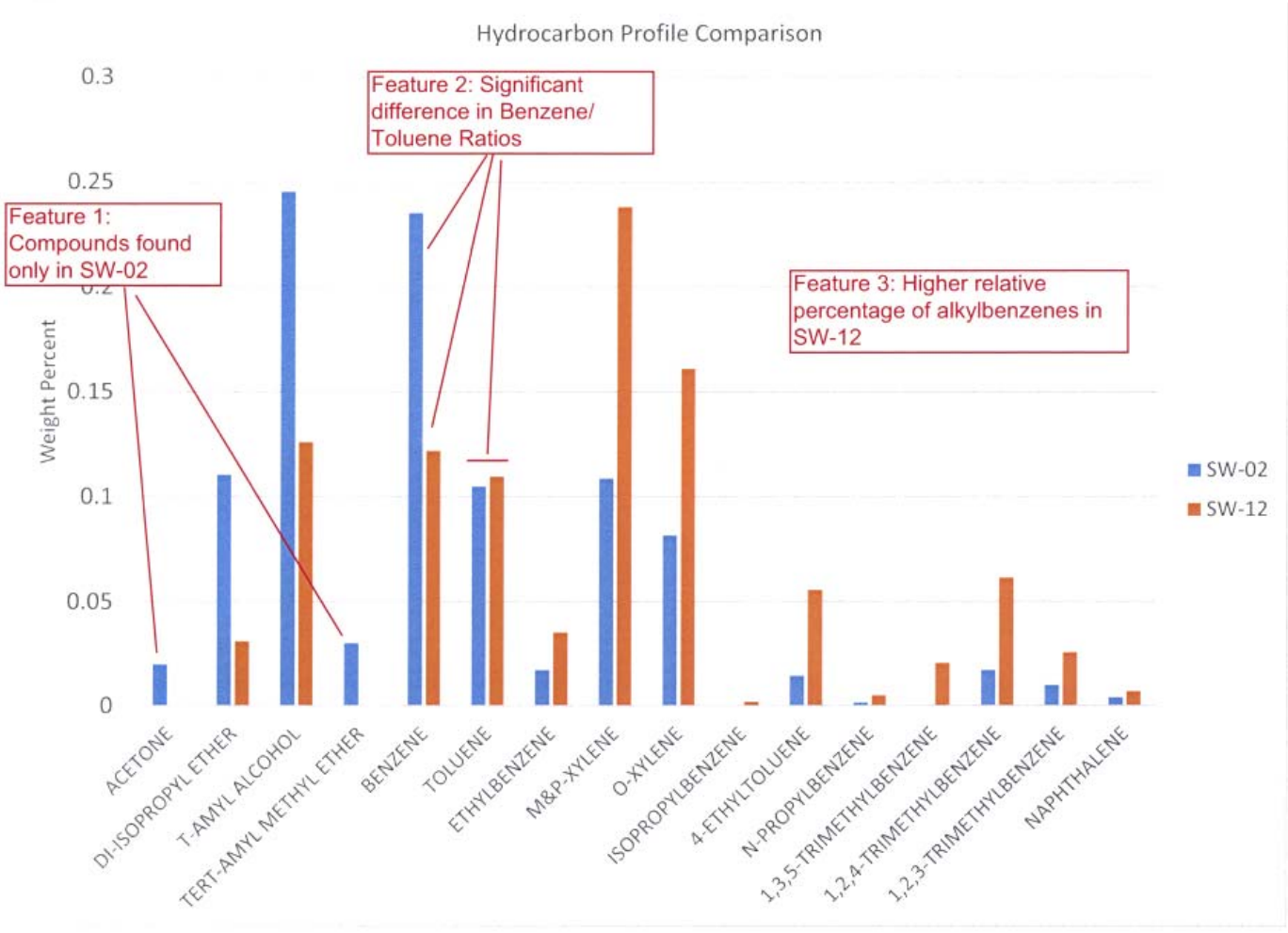
N

Base Map Source:
*Environmental Systems Research Institute (ESRI) ArcMap World Imagery, 2015
*United States Geological Survey (USGS) National Hydrography Dataset (NHD)

Surface Water Monitoring Plan
Corrective Action Plan Revision 2
Lewis Drive Remediation Site
Belton, South Carolina
Site ID #18693
"Kinder Morgan Belton Pipeline Release"

ch2m

FIGURE 2


Hydrocarbon Profile Comparison
Feature 1: Compounds found only in SW-02
Feature 2: Significant difference in Benzene/ Toluene Ratios
Feature 3: Higher relative percentage of alkylbenzenes in SW-12
Weight Percent
0.3
0.25
0.2
0.15
0.1
0.05
0
SW-02
SW-12
ACETONE
DI-ISOPROPYL ETHER
T-AMYL ALCOHOL
TERT-AMYL METHYL ETHER
BENZENE
TOLUENE
ETHYLBENZENE
M&P-XYLENE
O-XYLENE
ISOPROPYLBENZENE
4-ETHYLTOLUENE
N-PROPYLBENZENE
1,3,5-TRIMETHYLBENZENE
1,2,4-TRIMETHYLBENZENE
1,2,3-TRIMETHYLBENZENE
NAPHTHALENE

ENVIRONMENTAL®
STANDARDS
Setting the Standards for Innovative Environmental Solutions

March 12, 2018

Mr. Scott Powell, PE
Project Engineer
Jacobs
6600 Peachtree Dunwoody Road
400 Embassy Row, Suite 600
Atlanta, GA 30328, USA

Dear Mr. Powell:

Please find attached the Memorandum regarding the Review of Chandler AG Well Data, dated December 4, 2017, addressed to Mr. Jerry Aycock of KM Products Pipelines SE. I hereby certify that the memorandum, watermarked and secured in portable document format. My signature is affixed to this attached version and the document is locked from further editing.

I attest that the statements in the attached memorandum are true to the best of my knowledge and that the opinions therein are offered by myself, with no influence from others.

Please let me know if you have any questions or need further clarifications.

Sincerely,

David I Thal, CEAC, CQA
Principal Chemist
Environmental Standards
8331 East Walker Springs Lane
Suite 402
Knoxville TN, 37923

cc: Mr. Jerry Aycock – KM Products Pipelines SE
Files – Environmental Standards, Inc.

ENVIRONMENTAL® STANDARDS 30 YEARS 1987 · 2017

MEMORANDUM

Date: December 4, 2017

To: Mr. Jerry Aycock – KM Products Pipelines SE

From: Mr. David Thal CEAC, CQA – Environmental Standards, Inc.

Copy to: File – Environmental Standards, Inc.

Subject: Review of Chandler AG Well Data

Introduction

A release of an estimated 8,800 barrels of gasoline and a small amount of diesel fuel was identified and reported on December 8, 2014. The release was from a sleeve of a 26-inch product pipeline near Lewis Drive, Belton, South Carolina.

The site is located in the pipeline right-of-way between Lewis Drive, a rural two-lane undivided asphalt road, to the east and a hayfield to the west. The location on Lewis Drive is approximately 400 feet to the northwest of Lewis Drive's convergence with West Calhoun Road. (Figure 1)

A variety of source control, removal and other remediation actions were taken, including the installation of monitoring wells, recovery sumps, recovery wells, and recovery trenches. These actions included a recovery trench and recovery wells that were put in place to contain and control transport of contamination to Brown's Creek and an unnamed tributary thereto. Additionally, absorbent and impermeable booms were set up in the tributary itself as a backup measure.

Contamination from the release point is characterized by the chemical profile found in monitoring wells running northeast of the release point up to monitoring well 40 (MW-40, Figure 1). Given the regional hydrology and monitoring well testing done to date, migration beyond the unnamed tributary would not be expected. However, volatile hydrocarbons were detected in a sample from a well on private property further to the northeast, beyond Brown's Creek and the unnamed tributary. The sample was collected from a recently installed well, constructed of polyvinyl chloride (PVC pipe). The well was reportedly recently constructed and presumably joined by an adhesive or via solvent welding.

Evaluation

The sample was analyzed by ESC Laboratory Sciences of Mt. Juliet, Tennessee (ESC). An aliquot of the Chandler AG-W sample was also sent to, and analyzed by Pace Analytical Services' laboratory of Huntersville, North Carolina (Pace). The reported data from both laboratories was compared to results reported by ESC for a sample collected from MW-40.

The instrument data for the Chandler AG-W and MW-40 samples provided from the ESC analyses were reviewed for data quality, and for mass spectral features to determine whether the contaminants in the Chandler well could be from the Plantation Pipeline release.

The samples examined are summarized on Table 1:

Table 1 – Sample Summary

Field Sample ID	Location	Date:Time Collected	Laboratory Report	Laboratory Sample ID
Chandler-AG-W-100417	Chandler AG-W (Figure 1)	10/04/17:1425	ESC-L941579b	L941579-08
MW-40-110817	MW-40 (Figure 1)	11/08/17:0915	ESC-L949634	L949634-08
Chandler-AG-W-100417	Chandler AG-W (Figure 1)	10/04/17:1425	Pace-L941579b	L941579-08

A review of the quality control for the two analyses was conducted. The positive controls, negative controls, and chromatographic quality were reviewed in addition to system monitoring recoveries. Additionally a comparison of BTEX results from Pace and ESC was performed and the two analyses were found to be in agreement (within 14% relative standard deviation for ethylbenzene and 8.8% RSD for total xylenes). All method indices were found to be within acceptance criteria, and, when considered in conjunction with good chromatography evidenced in the ESC data package, support high confidence in the data obtained with regard to qualitative identification, accuracy, and precision.

A comparison of the BTEX profiles is presented in tabular form below (Table 2). In order to compare the profiles, each detected BTEX compound concentration was normalized to total BTEX and was calculated as weight percent of BTEX. The results are displayed in graphic form in the histogram in Figure 2. In the Figure 2 histogram, the results presented for the Chandler AG-W sample are the averaged results from the two laboratories reporting.

Table 2 – Summary of BTEX Detections (µg/L)

	MW-40-110817	Chandler-AG-W-100417	
Analyte	**Lab 1 (ESC)**	**Lab 1 (ESC)**	**Lab 2 (Pace)**
Benzene	13500	<1	<1
Toluene	23000	<1	<1
Ethylbenzene	<1000	37.5	32.6
M & P Xylenes	6040	170	155
O Xylenes	3250	56	52
Total Xylenes	9290	226	207

An examination of all mass spectra for discernable peaks of the ESC mass chromatogram for the Chandler AG-W-100417 was performed. The compounds that could be identified with good spectral fit above background are indicated in Figure 3 (annotated mass chromatogram). The review confirmed the presence of isomers of xylene, and the presence of ethylbenzene. The BTEX profiles for the two samples are quite different. The hydrocarbon pattern in MW-40 shows clearly detectable benzene, toluene, and xylenes typical of a gasoline profile. Ethylbenzene would normally be expected as well, but likely fell below the reporting threshold

of 1000 µg/L (as a result of a laboratory dilution performed in order to bring other components into the instrument calibration range). By contrast, the hydrocarbon profile for Chandler AG-W shows a predominance of xylene (mixed isomers), and a small amount of ethylbenzene (commonly present in xylene mixtures) with no detectable benzene or toluene (with a 1 µg/L reporting threshold. The ratio of meta- and para-xylenes in the MW-40 well, is 1.86 which differs significantly from the 2.98-3.06 ratio values observed (in the Pace and ESC data sets respectively) in the Chandler well sample. Non-target compounds detected in MW-40 sample but not in the Chandler AG-W sample include di-isopropyl ether and 1,2,3-trimethylbenzene. Acetone was observed in the Chandler AG-W well (with a 100 percent spectral match) at 10.9 µg/L, (>10 times higher than the benzene and toluene detection limit). If acetone were present at 10 times the toluene concentration in MW-40, the concentration expected would be >230,000 µg/L, but it was not detected at 1000 µg/L.

Because of the similarities in fate and transport properties of the BTEX compounds, xylenes from the gasoline source (*i.e.* the Lewis Road release) would have benzene and toluene present wherever the xylenes from the gasoline source were detected. In the case at hand, this absence of benzene and toluene alone provides adequate support to reject the hypothesis that the contaminants in the Chandler well share the same source as the MW-40 well. An additional line of evidence that the sources are different is the difference in isomer ratios for the xylenes present in the two samples. Finally, the presence of acetone in the Chandler AG-W sample at levels at least 10 times the detection limit of benzene and toluene also support a an alternative hypothesis, that the Chandler well contamination is from a source different than the source for MW-40.

The xylenes observed in the Chandler well may have been sourced from a variety of widely practiced applications. Xylenes are produced and distributed in high volumes in the United States. They are extensively used as thinners and solvents in paints, varnishes, adhesives, and inks. A xylene mixture can be used to thin lacquers when slower drying is desired. Xylenes are often used as a solvent carrier in pesticides products. Xylenes are used in removing adhesives and in working with epoxy resins. Acetone is also used in paint thinning and stripping applications, and in the application of pesticides. Any and all of these activities may reasonably be conducted in association with the installation of and maintenance of a well and surrounding structures.

Conclusions

A technical environmental forensic review of the laboratory data and information available regarding the hydrology of the area in which the Chandler AG well and the MW-40 wells was conducted. Based upon the GC/MS data it is clear that the source of contamination to the Chandler AG was not a gasoline release, and was different from the contamination in the MW-40 well. Based on a cursory evaluation of the surface features and site history there is no reason to suspect water migration from the area of the release toward the Chandler well to the northeast side of Brown's Creek or its tributary(ies).

The contamination present in the Chandler well appears to have been predominated by a solvent application of xylenes (known commercially as xylol) with some traces of acetone. Known applications of this type of solvent system include lacquer thinning and paint thinning when slower drying is desired, use as a solvent carrier in pesticides products, uses in adhesives removers and uses in working with epoxy resins. Acetone is also used in paint thinning and stripping applications, and in the application of pesticides. Any and all of these

activities may reasonably be conducted in association with the installation of and maintenance of a well and surrounding structures.

Any questions regarding this review may be directed to David Thal, CEAC, CQA at dthal@envstd.com.

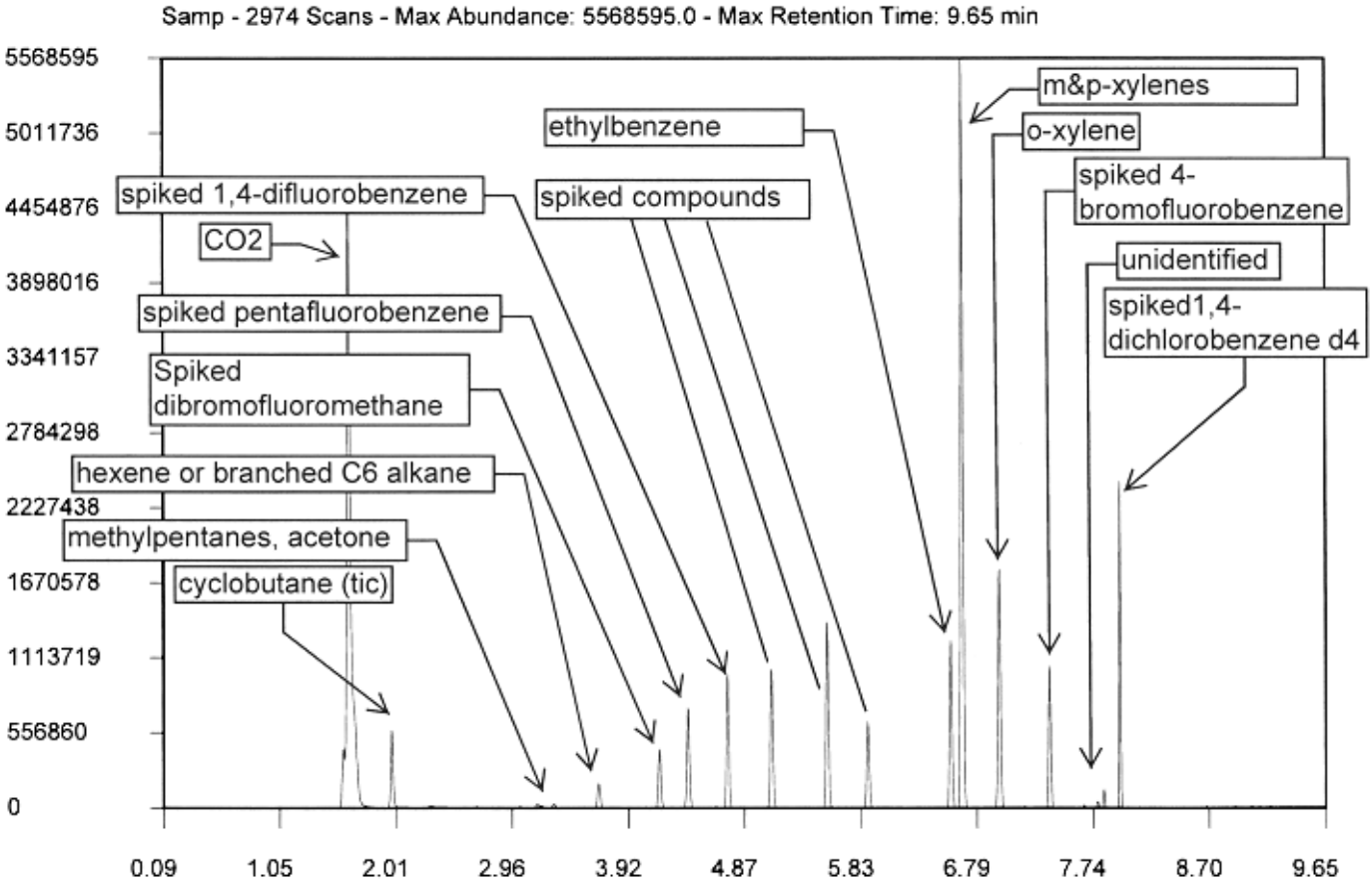
END OF MEMORANDUM

Digitally signed by David Thal
DN: cn=David Thal, o=Environmental Standards, ou=Knoxville Office, email=dthal@envstd.com, c=US
Date: 2018.03.12 13:08:21 -04'00'

Figure 1 - Sample: Chandler AG-W-100417

Min Abundance: 157.0
Max Abundance: 5568595.0
Min Retention Time: 0.09 Minutes = 5622 Milliseconds
Max Retention Time: 9.65 Minutes = 579168 Milliseconds
Scans: 2974
Ions: 27704
Scan Delay: 0.09 Minutes = 5428 Milliseconds
Scan Interval: 0.00 Minutes = 194 Milliseconds

This chromatogram has been brought to you by OpenChrom (http://www.openchrom.net).



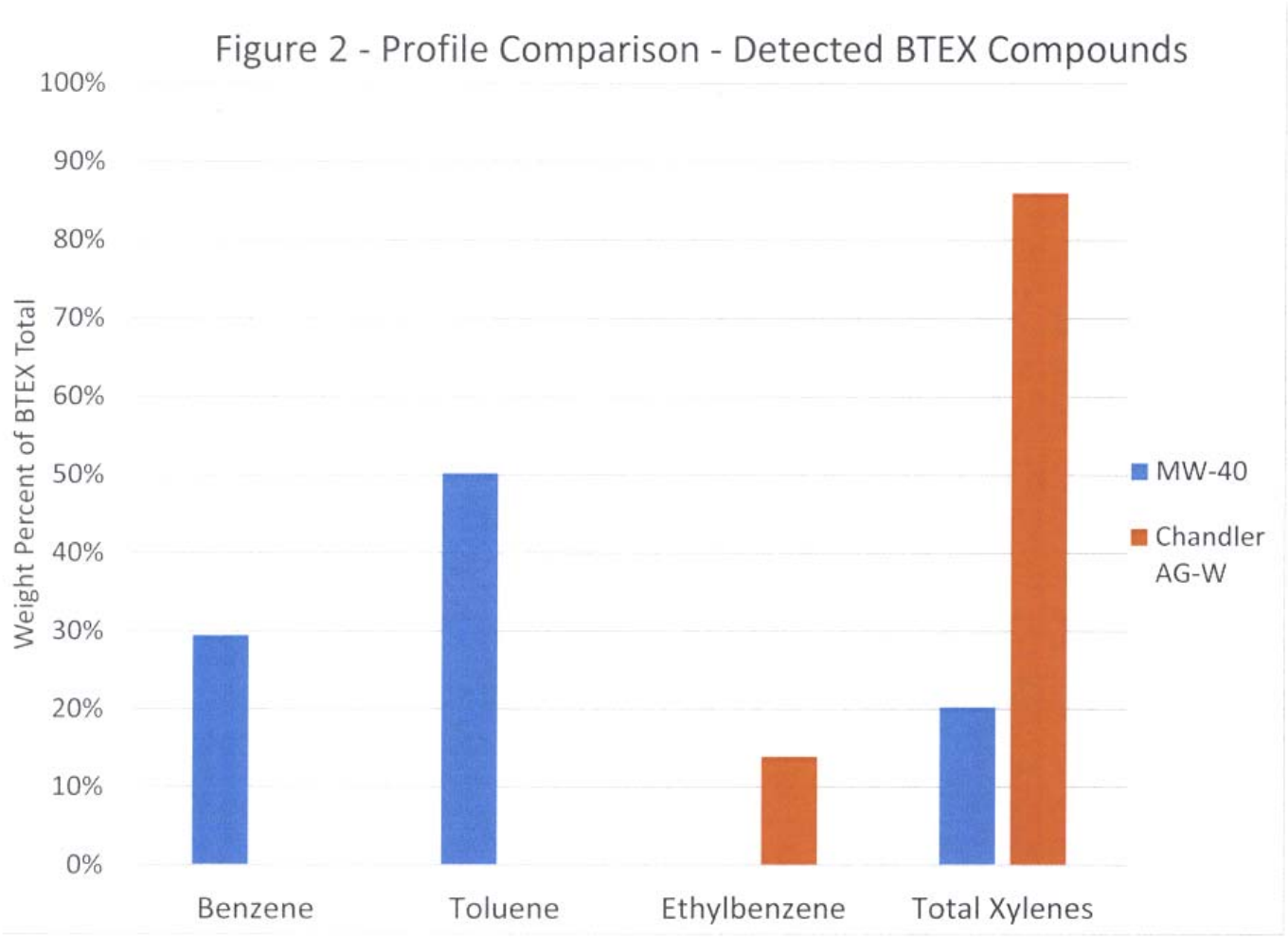
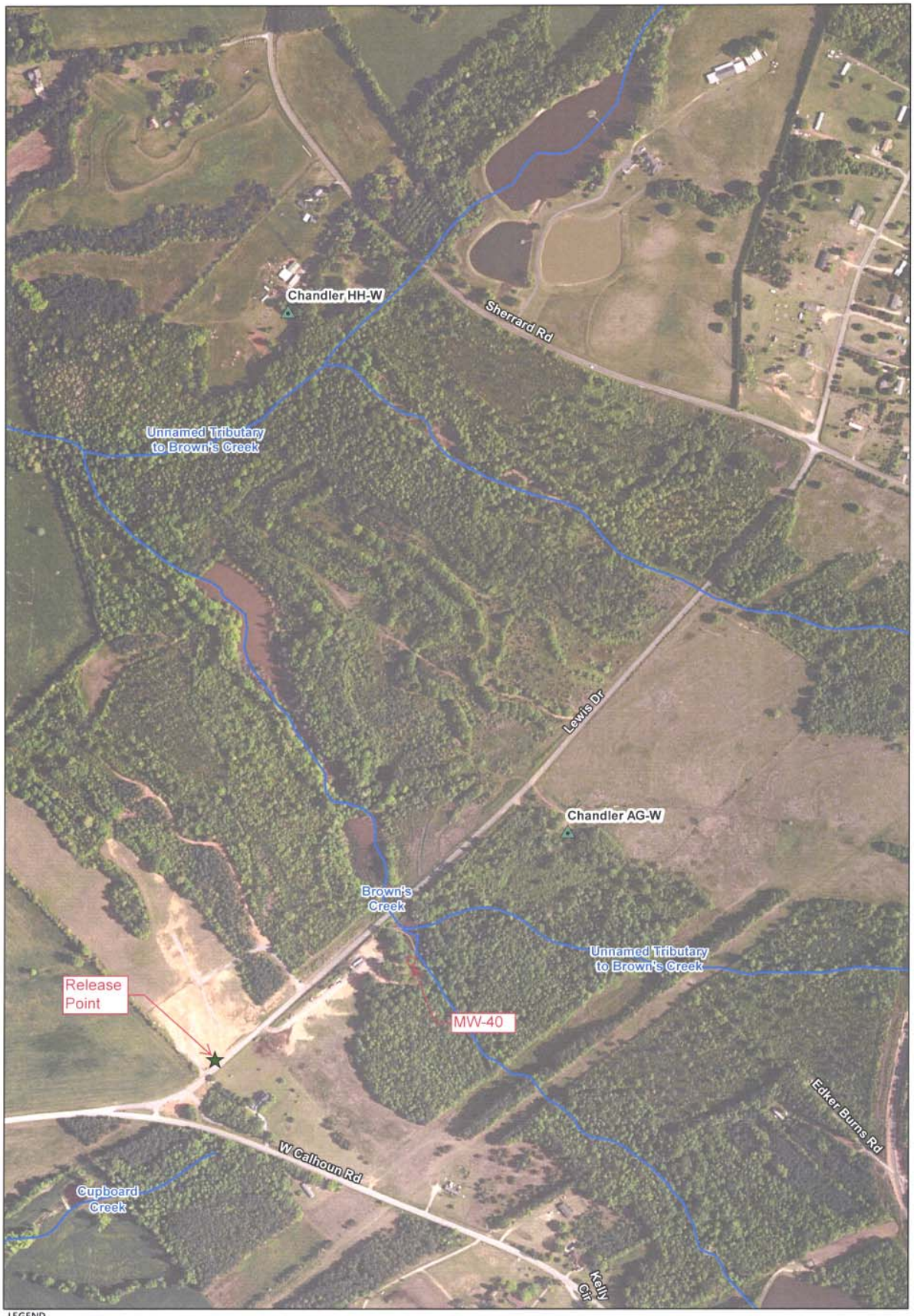


Figure 2 - Profile Comparison - Detected BTEX Compounds
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Weight Percent of BTEX Total
Benzene
Toluene
Ethylbenzene
Total Xylenes
MW-40
Chandler AG-W

Figure 3 - Well Locations



LEGEND

- Release Point
- Private Well Location
- National Hydrography Dataset Stream

0 200 400

Approximate scale in feet

Base Map Sources:
* ESRI Imagery Layer, 2015
* USGS National Hydrography Dataset (NHD)

FIGURE 1. Private Well Locations
Lewis Drive Release, Belton, South Carolina
Site ID #18693 "Kinder Morgan Belton Pipeline Release"