



## **AIR EMISSIONS COMPLIANCE TEST REPORT**

Property 01-115, Handy Andy #8

Air Sparging and Soil Vapor Extraction System

4403 NE St. James Road, Vancouver, Washington

Prepared for:

**Washington Department of Ecology**

Southwest Regional Office

Toxics Cleanup Program

P.O. Box 47775

Olympia, Washington 98504-7775

Prepared by:

**AMEC Environment & Infrastructure, Inc.**

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(503) 639-3400

On Behalf Of:

**TOC Holdings Co.**

2737 West Commodore Way

Seattle, Washington 98199

August 2012

Project No. 2-61M-076111.01.2

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Project No. 2-61M-076111.01.2

Washington Department of Ecology  
Southwest Regional Office  
Toxics Cleanup Program  
P.O. Box 47775  
Olympia, Washington 98504-7775

Attention: Mr. Mohsen Kourehdar, P.E.

**Subject: Air Emissions Compliance Test Report  
Property 01-115, Handy Andy #8  
Air Sparging and Soil Vapor Extraction System  
4403 NE St. James Road, Vancouver, Washington**

Dear Mr. Kourehdar:

On behalf of TOC Holdings Co., AMEC Environment & Infrastructure, Inc. (AMEC) is pleased to present this Air Emissions Compliance Test Report. This report presents the results of air emissions testing performed on July 26, 2012 at the soil vapor extraction system located at 4403 NE St. James Road in Vancouver, Washington. The testing was performed in accordance with the Comprehensive Test Plan in the Air Emissions Permit, issued under Consent Decree DE 99TC S-206.

Sincerely,

**AMEC Environment & Infrastructure, Inc.**



Lance B. Johnson, PE  
Senior Mechanical Engineer

**Reviewed by:**



Jack T. Spadaro, Ph.D., CHMM  
Project Manager

Attachments: Air Emissions Compliance Test Report

SS/cw

c: Mr. Mark Chandler, TOC Holdings Co.

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## **AIR EMISSIONS COMPLIANCE TEST REPORT**

Property 01-115, Handy Andy #8

Air Sparging and Soil Vapor Extraction System  
4403 NE St. James Road, Vancouver, Washington

### **1.0 INTRODUCTION**

A dissolved phase gasoline groundwater plume extends from the Handy Andy #8 gas station (3314 NE 44<sup>th</sup> Street) to Arnold Park, near the residence at 2818 NE Cherry Road in Vancouver, Washington (Figure 1). An air sparging and soil vapor extraction (AS/SVE) system has been installed to remediate petroleum impacted soil and groundwater within the plume. The AS/SVE equipment compound is located at 4403 NE St. James Road (Site), adjacent to the station. The AS/SVE system includes wells and piping on the station property, the property at 4403 NE St. James Road, nearby public roads downgradient of the station, and three commercial properties located south of NE 44<sup>th</sup> Street. Air emissions monitoring, sampling, and reporting are conducted at the AS/SVE system to satisfy requirements of the Air Emissions Permit issued by the Washington Department of Ecology (Ecology) under Consent Decree DE 99TC S-206. This Air Emissions Compliance Test Report, prepared by AMEC Environment & Infrastructure, Inc. (AMEC) on behalf of TOC Holdings Co. (formerly Time Oil Co.), contains the results of SVE system emissions testing performed on July 26, 2012.

### **1.1 AS/SVE SYSTEM OVERVIEW**

The AS/SVE system is designed to remove contaminants from the subsurface through physical processes and enhanced natural biological degradation processes. The AS/SVE equipment compound is located at 4403 NE St. James Road, adjacent to the service station (Figure 1). AS/SVE wells were originally installed in 2001 at the service station property, at 4403 NE St. James Road, along NE 44<sup>th</sup> Street (Station Area), and along NE St. James Road and NE 42<sup>nd</sup> Street (Mid-Plume Area). The AS/SVE system includes 40 AS wells and 16 SVE wells. A 15-horsepower positive displacement rotary lobe blower is used to inject air into selected AS wells, and up to three 5-horsepower regenerative blowers are used to extract vapors from the SVE wells.

Since the first quarter of 2006, two 500-pound vapor phase granular activated carbon (GAC) air treatment units and one 1,000-pound GAC unit have been used for air treatment as needed, depending on influent photoionization detector (PID) readings and/or air analytical results. The GAC units are changed out as needed in response to constituent breakthrough, indicated by



elevated VOC concentrations in the GAC effluent. The most recent GAC change out occurred on June 15, 2010.

Comparison of historical air analytical results with field PID readings collected since the system startup indicate that a PID reading of approximately 25 parts per million by volume (ppmv) corresponds to the total volatile organic compound (VOC) emission limit of 1.0-ton per year specified in the Site air discharge permit. Therefore, for field monitoring purposes, an effluent PID reading of 20 ppmv was set as a general trigger point for treatment of extracted soil vapors.

When PID readings indicate the influent VOC concentrations are consistently below treatment threshold limits, the carbon units are bypassed and the extracted soil vapors are discharged directly to the atmosphere. Currently the blowers are discharging directly to the effluent stack.

## **1.2 TEST PROGRAM**

The air emissions testing program consists of monitoring, sampling, and analytical testing activities at the AS/SVE system as outlined in the Air Emissions Permit under Consent Decree DE 99TC S-206 and the Comprehensive Test Plan. The Permit Reference Table (Table 1) contains a summary of the Air Emissions Permit requirements.

A vapor sample of the SVE system effluent was collected on July 26, 2012. A 1-liter stainless steel Summa canister was filled with air discharged from the SVE system at a sampling port located on the effluent stack. The vapor sample was submitted to Environmental Science Corp. (Mt. Juliet, Tennessee) and analyzed for VOCs, including permitted constituents benzene, toluene, ethylbenzene, and xylenes (BTEX) and total petroleum hydrocarbons as gasoline (TPH-G) by modified Method TO-15 (United States Environmental Protection Agency [EPA] Method TO-15). Chemical analysis of the sample was performed within the proper holding period.

The results of laboratory testing and the field measured system air flow rate were used to calculate an emission rate for the SVE system. The Comprehensive Test Plan For Air Emissions Permit Under Consent Decree No. De 99tc S-206 (AMEC, 2001) describes the testing procedures and the air flow and emission rate calculations in more detail.

## **2.0 DISCUSSION OF TESTING RESULTS**

The following sections provide a summary of the operation parameters and estimated emission rates for the SVE system.



## 2.1 AS/SVE SYSTEM OPERATING PARAMETERS

All three of the SVE blowers were operating throughout the monitoring period and during the air sampling event, with the exception of 1- to 2-week shutdowns prior to the February, May, and July groundwater sampling events. The SVE flow rate of the system at the time of air sampling was determined to be 453 standard cubic feet per minute ([scfm] Table 2, attached), using vacuum measurements collected before each blower, and pressure measurements collected after each blower on July 26, 2012. The readings are collected in actual cubic feet per minute (acfm), if actual site conditions are different from the standard or reference conditions, corrections must be made to reflect the actual conditions of pressure, temperature and relative humidity (i.e., convert to acfm using the standard equation for conversion). Blower performance calculations, including head (used for centrifugal compressors) and horsepower, are based on actual (not standard) conditions existing at the inlet and outlet connections of the blower. These vacuum and pressure measurements were used with the blower manufacturer's "vacuum versus flow curve" to determine blower flow rates (Appendix A). The total flow of the system is the sum of the flows from each of the three operational SVE blowers. It should be noted that the blower curves used to calculate system flow rates are representative of factory conditions, and will yield conservatively high system flow rates when applied to blowers that have been in use and have experienced wear that lower blower efficiencies. The average calculated total flow from the blowers during the period between January 2012 and July 2012 was 513 scfm.

The manufacturer's blower curve is included in Appendix A. Data for system operating parameters and the derived system flow rates for the expanded system operation between July 2011 and July 2012 are included in Table 2. The flow rate conversion calculation is shown in attached Table 3.

## 2.2 AS/SVE SYSTEM AIR EMISSIONS

Laboratory test results are included in Appendix B. The analytical results for the July 26, 2012 air effluent sample indicated that BTEX compounds were not detected above their respective method reporting limits. Permit regulated constituent TPH-G was detected in the air sample at a concentration of 1,400 micrograms per cubic meter (equivalent to 1.4 micrograms per liter ([ $\mu\text{g/L}$ ] or 330 parts per billion by volume [ppbv])). Calculations used for the conversion of the laboratory reported concentration units are included in Table 4, attached.

The emission rate of total VOCs to the atmosphere was calculated to be 0.010 tons per year (Table 5), based on the TPH-G concentration of 1.4  $\mu\text{g/L}$  in the effluent sample (Table 4, attached) and the total system flow rate of 513 scfm, on July 26, 2012 (Table 2). Vapor readings collected from the effluent stack with a PID have generally been below 1 ppmv. From the original AS/SVE

system startup on January 15, 2001 through the July 26, 2012 monitoring event, the estimated cumulative emission of VOCs was approximately 0.65 tons (Table 5, attached).

Analytical results of previous Site soil gas samples indicate that TPH-G accounts for the majority of VOCs in the soil gas. As such, the emission calculation assumes that TPH-G analytical results account for all of the VOCs in the effluent sample. The effluent air stream was odorless, and emissions were not visible. Emission calculations are included in Table 5 (attached).

## 2.3 MONITORING AND RECORD KEEPING

As stipulated in the Air Emissions Permit, air emission testing events are conducted on a biannual basis. The results of the 23<sup>rd</sup> emission testing event for the AS/SVE system, covering the period from January 2012 through July 2012, are detailed in this report and summarized in Table 4 (attached). System data required to calculate air flow rates will continue to be recorded on a monthly basis, at a minimum, in accordance with the requirements of the existing permit.

**AMEC Environment & Infrastructure, Inc.**



Stephanie Syring  
Engineering Staff

SS/cw

**Reviewed by:**



Lance B. Johnson, PE  
Senior Mechanical Engineer



## LIMITATIONS

This report was prepared exclusively for TOC Holdings Co. by AMEC Environment & Infrastructure, Inc., (AMEC). The quality of information, conclusions, and estimates contained herein is consistent with the level of effort involved in AMEC services and based on: i) information available at the time of preparation, ii) data supplied by outside sources, and iii) the assumptions, conditions, and qualifications set forth in this report. This Air Emissions Compliance Test Report is intended to be used by TOC Holdings Co. for Property 01-115 (Handy Andy #8) only, subject to the terms and conditions of its contract with AMEC. Any other use of, or reliance on, this report by any third party is at that party's sole risk.

The findings contained herein are relevant to the dates of the AMEC Site visit and should not be relied upon to represent conditions at later dates. In the event that changes in the nature, usage, or layout of the property or nearby properties are made, the conclusions and recommendations contained in this report may not be valid. If additional information becomes available, it should be provided to AMEC so the original conclusions and recommendations can be modified as necessary.



**TABLES**

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**TABLE 1**  
**Permit Reference Table**  
**Air Sparging and Soil Vapor Extraction System**  
**TOC Holdings Co., Property 01-115, Handy Andy #8**  
**4403 NE St. James Road**  
**Vancouver, Washington**

<b>Emission Limitations</b>	<b>Permit Limit/Requirement</b>
Visible emissions shall be negligible	Zero percent
VOC emissions	1.0 ton per year combined
Benzene	540 ppbV
Toluene	2,980 ppbV
Ethylbenzene	540 ppbV
Xylenes	2,870 ppbV
TPH-G	33,900 ppbV
<b>Operating Limitations</b>	<b>Permit Limit/Requirement</b>
Discharge from effluent stack to atmosphere	Vertical 10 feet above ground surface
Air flow rate through system	Maximum of 780 acfm
<b>Monitoring/Record Keeping</b>	<b>Permit Limit/Requirement</b>
VOC emissions	Tested biannually and as noted in permit
Gaseous flow rate	Recorded monthly
Record retention	Maintain for three years
Semi-annual report to Ecology	30 days after recording period

Notes:

The emissions limitations for BTEX and TPH-G are 24-hour average effluent concentrations

acfm = actual cubic feet per minute

ppbV = parts per billion by volume

TABLE 2  
Temperature, Pressure, and Flow Data for Air Emissions Permit  
Air Sparging and Soil Vapor Extraction System  
TOC Holdings Co., Property 01-115, Handy Andy #8  
4403 NE St. James Road  
Vancouver, Washington

Date	Oxidizer Temp (deg F)	Pressure	Pressure	Pressure	Pressure	Vacuum	Vacuum	Vacuum	Vacuum	Derived	Derived	Derived	Derived	Flow	Flow	Flow	Flow	Total Flow (scfm)
		After	After	After	After	Before	Before	Before	Before	Vacuum	Vacuum	Vacuum	Vacuum	(from Curve)	(from Curve)	(from Curve)	(from Curve)	
		Blower #1	Blower #2	Blower #3	Blower #4	Blower #1	Blower #2	Blower #3	Blower #4	Blower #1	Blower #2	Blower #3	Blower #4	Blower #1	Blower #2	Blower #3	Blower #4	
		(in. WC)	(in. WC)	(in. WC)	(in. WC)	(in. WC)	(in. WC)	(in. WC)	(in. WC)	(in. WC)	(in. WC)	(in. WC)	(in. WC)	(scfm)	(scfm)	(scfm)	(scfm)	
07/06/11	NA	0	0	0	0	0	35	56	0	0	35	56	0	0	228	176	0	404
07/21/11	NA	0	0	0	0	0	40	60	0	0	40	60	0	0	217	165	0	381
08/02/11	NA	0	0	0	0	0	45	60	0	0	45	60	0	0	204	165	0	369
08/15/11	NA	0	0	0	0	0	45	60	0	0	45	60	0	0	204	165	0	369
09/24/11	NA	0	0	0	0	0	0	52	0	0	0	52	0	0	0	186	0	186
10/03/11	NA	0	0	0	0	0	35	52	0	0	35	52	0	0	228	186	0	415
11/11/11	NA	0	0	0	0	0	0	60	0	0	0	60	0	0	0	165	0	165
11/15/11	NA	0	0	0	0	0	40	0	0	0	40	0	0	0	217	0	0	217
12/16/11	NA	0	0	0	0	0	35	53	53	0	35	53	53	0	228	184	184	596
12/30/11	NA	0	0	0	0	0	40	50	50	0	40	50	50	0	217	192	192	600
04/03/12	NA	0	0	0	0	0	40	50	50	0	40	50	50	0	217	192	192	600
05/04/12	NA	0	0	0	0	0	55	55	55	0	55	55	55	0	178	178	178	535
05/11/12	NA	0	0	0	0	0	55	55	55	0	55	55	55	0	178	178	178	535
05/25/12	NA	0	0	0	0	0	58	58	58	0	58	58	58	0	170	170	170	511
06/05/12	NA	0	0	0	0	0	58	58	58	0	58	58	58	0	170	170	170	511
07/03/12	NA	0	0	0	0	0	60	60	60	0	60	60	60	0	165	165	165	495
07/19/12	NA	0	0	0	0	0	64	64	64	0	64	64	64	0	154	154	154	461
07/26/12	NA	0	0	0	0	0	65	65	65	0	65	65	65	0	151	151	151	453

Average Total Flow (January 2012 through July 2012): 513

Notes:  
Data in **bold** represent data gathered for an air emissions report  
Flows were determined from the Rotron EN707 flow(y) versus vacuum(x) curve (Appendix A) and the polynomial fitted equation:  
y = -0.0088x2 - 1.7033x + 298.74  
deg F = degrees Fahrenheit  
in. WC = pressure measured in inches of water column  
scfm = standard cubic feet per minute  
NA = Field data not available  
"from Curve" = flows calculated using blower curves representative of factory conditions  
See Table B-1 and B-2 (Appendix B) for data prior to 07/06/11

**TABLE 3**  
**Calculation for Flow Permit Limitation Conversion**  
**Air Sparging and Soil Vapor Extraction System**  
**TOC Holdings Co., Property 01-115, Handy Andy #8**  
**4403 NE St. James Road**  
**Vancouver, Washington**

Flow Permit Limit $Q_{acfm}$ (ft <sup>3</sup> /min)	Temperature @ stack (deg C)	Pressure @ stack (psia)	$\rho_{blow}$ (lbm/ft <sup>3</sup> )	Equivalent Permit Limit $Q_{scfm}$ (ft <sup>3</sup> /min)
780	30	14.7	0.0728	757

Converts 780 actual cubic feet per minute (acfm) to equivalent standard cubic feet per minute (scfm).

**Equations Used:**

Conservation mass:  $Q_{acfm} \times \rho_{blow} = Q_{scfm} \times \rho_{stp}$

therefore,

where Q is flow,  $\rho_{blow}$  is density of air at pressure side of blowers, and  $\rho_{stp} = 0.075 \text{ lbm/ft}^3$

and  $\rho_{blow}$  is solved from the perfect gas law:  $PV = nR_uT$  or  $P = \rho \times (R_u/MW) \times T$

where  $R_u = 1,545 \text{ (lbf X ft)/(pmole X } ^\circ\text{R)}$ .

**Notes and Assumptions for Conversion of acfm to scfm:**

1. The 780 acfm permit limit is assumed to be at the system stack.
2. The gas is air with molecular weight of 29.0 lb/pmole.
3. The air is a perfect gas following the perfect gas law:  $PV = n R_u T$ .

**TABLE 4**  
**Conversion Calculations for Air Emission Concentrations**  
**Air Sparging and Soil Vapor Extraction System**  
**TOC Holdings Co., Property 01-115, Handy Andy #8**  
**4403 NE St. James Road**  
**Vancouver, Washington**

Sampling Date	Benzene		Toluene		Ethylbenzene		Xylenes		TPH-G	
	(µg/L) <sup>1</sup>	(ppbv)	(µg/L)	(ppbv)	(µg/L)	(ppbv)	(µg/L)	(ppbv)	(µg/L)	(ppbv)
4/12/2001	0.10 U	31	0.10 U	27	0.10 U	23	0.50 U	120	10.0 U	2,440
5/16/2001	0.10 U	31	0.10 U	27	0.10 U	23	0.30 U	69	10.0 U	2,440
8/13/2001	0.10 U	31	0.10 U	27	0.10 U	23	0.30 U	69	13.3	3,245
1/14/2002	0.10 U	31	0.10 U	27	0.10 U	23	0.30 U	69	10.0 U	2,440
7/10/2002	0.10 U	31	0.10 U	27	0.10 U	23	0.30 U	69	10.0 U	2,440
1/13/2003 <sup>2</sup>	0.10 U	31	0.23	61	0.31	72	1.2	276	49	11,834
7/15/2003	0.48	150	0.10 U	27	0.10 U	23	0.30 U	69	10.0 U	2,440
1/20/2004	0.10 U	31	0.10 U	27	0.10 U	23	0.30 U	69	10.0 U	2,440
7/12/2004	0.10 U	31	0.10 U	27	0.10 U	23	0.30 U	69	10.0 U	2,440
1/27/2005	0.026	8.1	0.024	6.4	0.052	12	0.53	121	2.5	615
7/27/2005	0.10 U	31	0.10 U	27	0.10 U	23	0.20 U	46	10.0 U	2,440
1/31/2006	0.10 U	31	0.10 U	27	0.10 U	23	0.20 U	46	10.0 U	2,440
7/26/2006	0.10 U	31	0.10 U	27	0.10 U	23	0.20 U	46	10.0 U	2,440
1/25/2007	0.96 U	300	1.5 U	400	1.7 U	400	6.1 U	1,400	22	5,300
7/11/2007	0.10 U	31	0.10 U	27	0.10 U	23	0.20 U	46	10 U	2,440
1/21/2008	0.50 U	160	5.7E-03	1.5	1.7E-03 U	0.40	5.2E-03 U	1.2	0.62	151
6/27/2008	1.3E-03 U	0.40	1.5E-03 U	0.40	1.7E-03 U	0.40	5.2E-03 U	1.2	16	3,904
1/28/2009	1.3E-03 U	0.40	1.5E-03 U	0.40	1.7E-03 U	0.40	5.2E-03 U	1.2	0.50	122
6/29/2009	1.3E-03 U	0.40	2.7E-03	0.72	1.7E-03 U	0.40	5.2E-03 U	1.2	0.41 U	100
1/28/2010	1.3E-03 U	0.40	2.6E-03	0.69	1.7E-03 U	0.40	6.5E-03	1.5	2.0	488
7/23/2010	1.3E-03 U	0.40	5.3E-03	1.41	1.7E-03 U	0.40	5.2E-03 U	1.2	0.5	122
1/21/2011	1.3E-03 U	0.40	2.2E-03	0.58	1.7E-03 U	0.40	5.2E-03 U	1.2	0.99	242
8/15/2011	2.6E-03 U	0.80	3.0E-03 U	0.80	1.9E-02	4.40	5.4E-01	124	6.6	1,600
12/30/2011	1.3E-03 U	0.40	1.5E-03 U	0.40	1.7E-03 U	0.40	1.2E-03 U	0.28	0.4 U	100
7/26/2012	1.3E-03 U	0.40	1.5E-03 U	0.40	1.7E-03 U	0.40	1.2E-03 U	0.28	1.4	330
Permit Limits:	-	540	-	2,980	-	540	-	2,870	-	33,900

**Notes:**

<sup>1</sup> Microgram per cubic meter results from analysis are divided by 1,000 to yield microgram per liter (µg/L)

<sup>2</sup> Treatment bypassed due to low influent concentration, influent (but not effluent) sample was collected.

**Conversion:** µg/L X (1 g/1,000,000 µg) X (1/MW<sub>x</sub> g/mole) X (24.4 L air/ 1 mole) = moles<sub>x</sub>/moles<sub>air</sub> = **ppbv** X 10<sup>-9</sup>

g = gram

MW<sub>x</sub> = molecular weight in gram/mole

ppbv = parts per billion by volume

TPH-G = gasoline range total petroleum hydrocarbon

U = Analyte not detected at the indicated detection limit

µg/L = micrograms per liter

ppbv = parts per billion by volume

Conversions assume dry air at standard temperature and pressure.

Conversion for TPH-G assumes a TPH-G molecular weight of approximately 100 g/mole.

Molecular Weights: B = 78 grams (g)/mole, T = 92 g/mole, E = 106 g/mole, X = 106 g/mole.

When analytical results indicate an analyte is below laboratory detection limits, the detection limit is used in calculations.

**TABLE 5**  
**Calculations for Total VOCs Emitted from the System**  
**Air Sparging and Soil Vapor Extraction System**  
**TOC Holdings Co., Property 01-115, Handy Andy #8**  
**4403 NE St. James Road**  
**Vancouver, Washington**

Sampling Date	Maximum VOCs Emission Rate (Estimate) (tons/year)	Estimated Cumulative VOC Emissions Since Startup (tons)
1/15/2001	-	-
4/12/2001	0.060	0.014
5/16/2001	0.066	0.021
8/13/2001	0.089	0.042
1/14/2002	0.050	0.064
7/10/2002	0.064	0.094
1/13/2003	0.313	0.255
7/15/2003	0.062	0.286
1/20/2004	0.059	0.316
7/12/2004	0.055	0.342
1/27/2005	0.015	0.350
7/27/2005	0.054	0.377
1/31/2006	0.071	0.414
7/26/2006	0.083	0.454
1/25/2007	0.105	0.507
7/11/2007	0.076	0.541
1/21/2008	0.004	0.543
6/27/2008	0.117	0.594
1/28/2009	0.004	0.596
6/29/2009	0.004	0.598
1/28/2010	0.021	0.610
7/23/2010	0.004	0.612
1/21/2011	0.002	0.613
8/15/2011	0.058	0.646
12/30/2011	0.004	0.647
7/26/2012	0.010	0.653

**Permit Limit:**

1.0 ton/year

**Emissions Calculation Used:**

$\mu\text{g/L} \times (1 \text{ g}/1,000,000 \text{ } \mu\text{g}) \times (1 \text{ lbm}/453.6 \text{ g}) \times (1 \text{ ton}/2,000 \text{ lbm}) \times (28.32 \text{ L}/\text{ft}^3)$

$\times \text{scfm} \times (525,600 \text{ min}/\text{yr}) = \text{tons}/\text{year}$

**Notes:**

Flow rates (in scfm) used in calculations are from Table 1.

Concentrations (in  $\mu\text{g/L}$ ) used in calculations are from TPH-G data in Table 3.

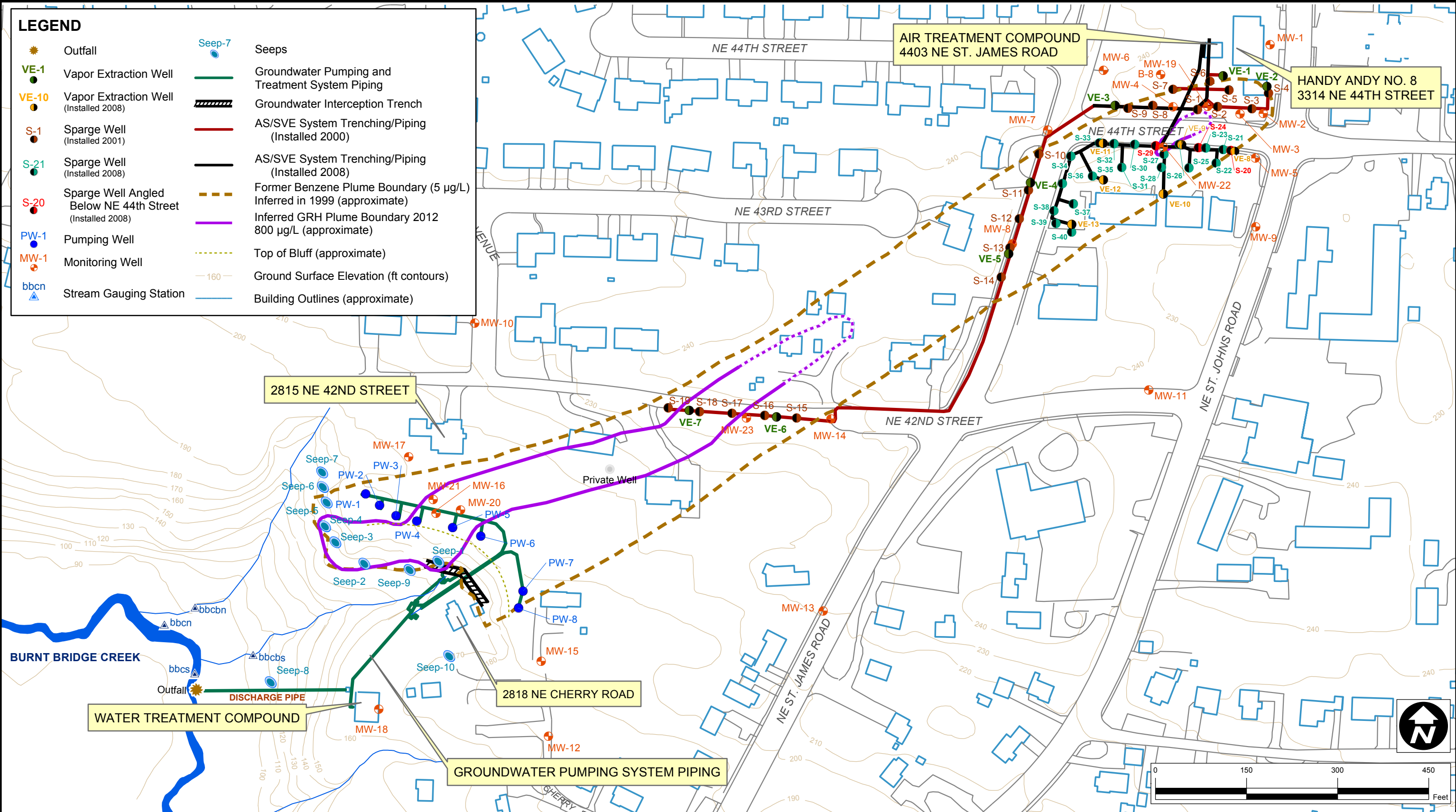
When analyte is below the laboratory detection limit, the detection limit is used in the emission calculation.

Total VOCs are assumed to be accounted for in the TPH-G analytical results.

VOC = volatile organic compound

**FIGURE**

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**NOTE:**  
Well coordinates and elevations data derived from survey completed in December 2008 by Ztec.  
  
Base map used is site.dwg, July 1996, AEE.  
  
All other existing site features from measurements completed by AMEC employees. Location of these features are not from data gathered by a registered land surveyor and should be considered approximate.

CLIENT:  
**TOC HOLDINGS CO.**

**AMEC**  
7376 SW Durham Road  
Portland, OR, U.S.A. 97224



DWN BY: PM / BRJ  
CHK'D BY: JTS  
DATUM: NAD83  
PROJECTION: WA S.P. South  
SCALE: 1 inch = 150 feet

PROJECT: **TOC HOLDINGS CO. No. 01-115**  
**3314 NE 44TH STREET**  
**VANCOUVER, WASHINGTON**

TITLE: **SITE PLAN**

DATE: JULY 2012  
PROJECT NO.: 2-61M-076111-2-2  
REV. NO.: 1  
FIGURE NO.: **FIGURE 1**

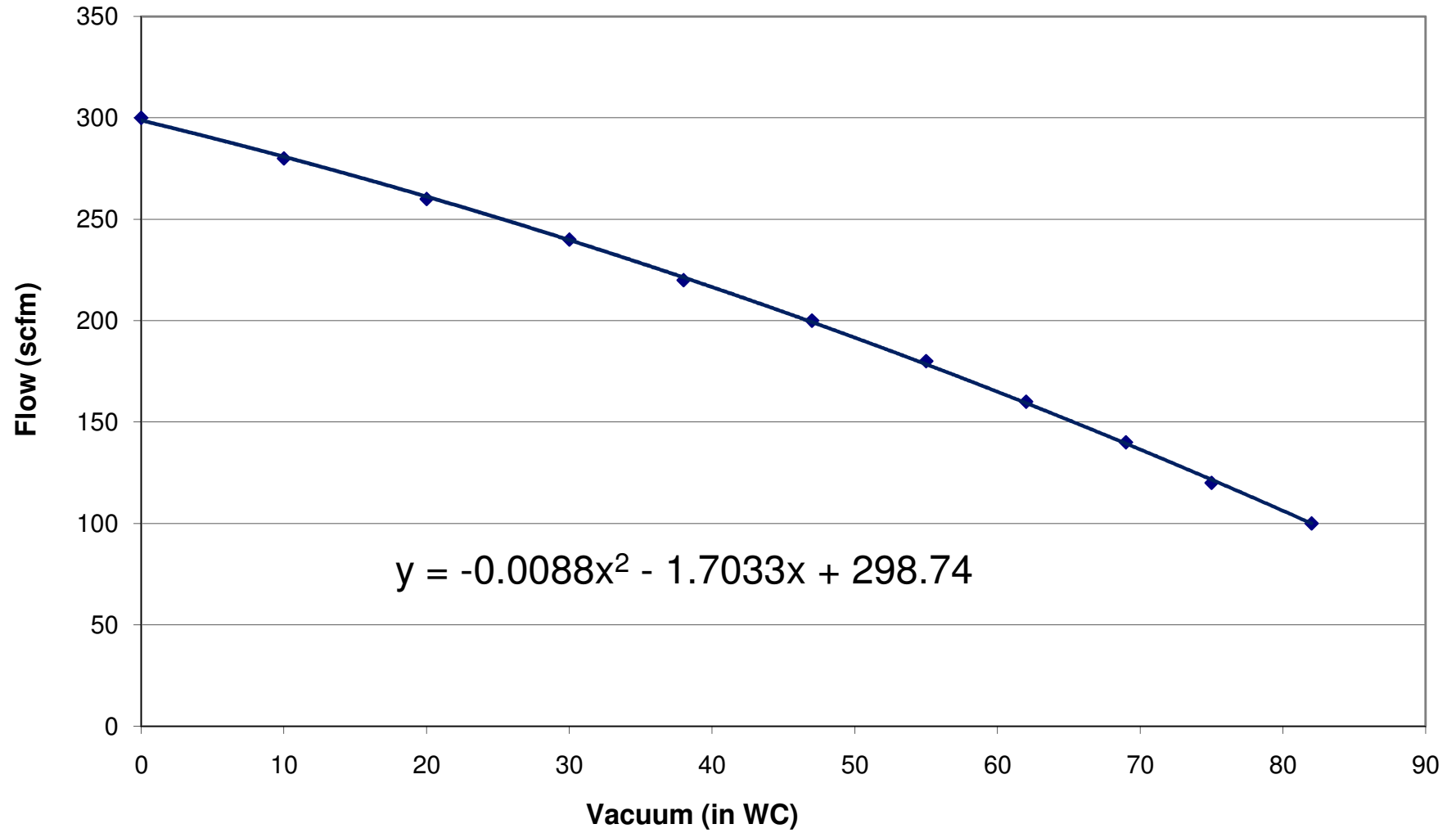


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## **APPENDIX A**

### Reference Information

## Rotron EN707 Vacuum v. Flow Curve



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**APPENDIX B**

Reported Laboratory Data



12065 Lebanon Rd.  
Mt. Juliet, TN 37122  
(615) 758-5858  
1-800-767-5859  
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

Stephanie Syring  
AMEC Earth & Environmental - OR  
7376 SW Durham Road  
Portland, OR 97224

## Report Summary

Wednesday August 01, 2012

Report Number: L587278


Samples Received: 07/28/12

Client Project:

Description: Handy Andy - Time Oil

The analytical results in this report are based upon information supplied by you, the client, and are for your exclusive use. If you have any questions regarding this data package, please do not hesitate to call.

Entire Report Reviewed By:

  
Jarred Willis , ESC Representative

### Laboratory Certification Numbers

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - 01157CA, CT - PH-0197,  
FL - E87487, GA - 923, IN - C-IN-01, KY - 90010, KYUST - 0016,  
NC - ENV375/DW21704/BIO041, ND - R-140, NJ - TN002, NJ NELAP - TN002,  
SC - 84004, TN - 2006, VA - 460132, WV - 233, AZ - 0612,  
MN - 047-999-395, NY - 11742, WI - 998093910, NV - TN000032011-1,  
TX - T104704245-11-3, OK - 9915, PA - 68-02979

Accreditation is only applicable to the test methods specified on each scope of accreditation held by ESC Lab Sciences.

Note: The use of the preparatory EPA Method 3511 is not approved or endorsed by the CA ELAP.

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# REPORT OF ANALYSIS

Stephanie Syring  
AMEC Earth & Environmental - OR  
7376 SW Durham Road  
Portland, OR 97224

August 01, 2012

Date Received : July 28, 2012  
Description : Handy Andy- Time Oil  
Sample ID : EFF-AIR-072612  
Collected By : WJM  
Collection Date : 07/26/12 09:30

ESC Sample # : L587278-01

Site ID :

Project # :

Parameter	Cas#	Mol Wght	RDL1	RDL2	ppbv	ug/m3	Method	Date	Dil.
Volatile Organics									
TPH (GC/MS) Low Fraction	8006-61-9	101	100.	410.	330	1400	TO-15	08/01/12	2
Benzene	71-43-2	78.1	0.400	1.30	< 0.40	< 1.3	TO-15	08/01/12	2
Ethylbenzene	100-41-4	106	0.400	1.70	< 0.40	< 1.7	TO-15	08/01/12	2
MTBE	1634-04-4	88.1	0.400	1.40	< 0.40	< 1.4	TO-15	08/01/12	2
Naphthalene	91-20-3	128	1.26	6.60	< 1.3	< 6.6	TO-15	08/01/12	2
2-Propanol	67-63-0	60.1	2.50	6.10	< 2.5	< 6.1	TO-15	08/01/12	2
Toluene	108-88-3	92.1	0.400	1.50	< 0.40	< 1.5	TO-15	08/01/12	2
m&p-Xylene	1330-20-7	106	0.800	3.50	< 0.80	< 3.5	TO-15	08/01/12	2
o-Xylene	95-47-6	106	0.400	1.70	< 0.40	< 1.7	TO-15	08/01/12	2
1,4-Bromofluorobenzene	460-00-4				103.13	% Rec.	TO-15	08/01/12	2

RDL1 = ppbv , RDL2 = ug/m3

Note:

Units are based on (STP) - Standard Temperature and Pressure

The reported analytical results relate only to the sample submitted.

This report shall not be reproduced, except in full, without the written approval from ESC.

Reported: 08/01/12 15:41 Printed: 08/01/12 16:12



**YOUR LAB OF CHOICE**

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Stephanie Syring  
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Portland, OR 97224

Quality Assurance Report  
Level II

L587278

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August 01, 2012

Analyte	Result	Laboratory Blank		Limit	Batch	Date Analyzed
		Units	% Rec			
2-Propanol	< 1.25	ppb			WG605389	07/31/12 16:00
Benzene	< .2	ppb			WG605389	07/31/12 16:00
Ethylbenzene	< .2	ppb			WG605389	07/31/12 16:00
m&p-Xylene	< .4	ppb			WG605389	07/31/12 16:00
MTBE	< .2	ppb			WG605389	07/31/12 16:00
Naphthalene	< .63	ppb			WG605389	07/31/12 16:00
o-Xylene	< .2	ppb			WG605389	07/31/12 16:00
Toluene	< .2	ppb			WG605389	07/31/12 16:00
TPH (GC/MS) Low Fraction	< 50	ppb			WG605389	07/31/12 16:00
1,4-Bromofluorobenzene		% Rec.	94.48	60-140	WG605389	07/31/12 16:00

Analyte	Units	Laboratory Control Sample		% Rec	Limit	Batch
		Known Val	Result			
2-Propanol	ppb	3.75	3.56	95.0	70-130	WG605389
Benzene	ppb	3.75	3.50	93.5	70-130	WG605389
Ethylbenzene	ppb	3.75	3.80	101.	70-130	WG605389
m&p-Xylene	ppb	7.5	7.39	98.5	70-130	WG605389
MTBE	ppb	3.75	3.97	106.	70-130	WG605389
Naphthalene	ppb	3.75	4.09	109.	54-154	WG605389
o-Xylene	ppb	3.75	3.87	103.	70-130	WG605389
Toluene	ppb	3.75	3.77	101.	70-130	WG605389
TPH (GC/MS) Low Fraction	ppb	150	138.	92.0	70-130	WG605389
1,4-Bromofluorobenzene				94.41	60-140	WG605389

Analyte	Units	Laboratory Control Sample Duplicate			Limit	RPD	Limit	Batch
		Result	Ref	%Rec				
2-Propanol	ppb	3.18	3.56	85.0	70-130	11.3	25	WG605389
Benzene	ppb	3.22	3.50	86.0	70-130	8.53	25	WG605389
Ethylbenzene	ppb	3.52	3.80	94.0	70-130	7.55	25	WG605389
m&p-Xylene	ppb	6.92	7.39	92.0	70-130	6.49	25	WG605389
MTBE	ppb	3.69	3.97	98.0	70-130	7.38	25	WG605389
Naphthalene	ppb	3.90	4.09	104.	54-154	4.77	26	WG605389
o-Xylene	ppb	3.57	3.87	95.0	70-130	7.95	25	WG605389
Toluene	ppb	3.56	3.77	95.0	70-130	5.64	25	WG605389
TPH (GC/MS) Low Fraction	ppb	134.	138.	89.0	70-130	2.98	25	WG605389
1,4-Bromofluorobenzene				96.72	60-140			WG605389

Batch number /Run number / Sample number cross reference

WG605389: R2282774: L587278-01

\* \* Calculations are performed prior to rounding of reported values.

\* Performance of this Analyte is outside of established criteria.

For additional information, please see Attachment A 'List of Analytes with QC Qualifiers.'



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August 01, 2012

The data package includes a summary of the analytic results of the quality control samples required by the SW-846 or CWA methods. The quality control samples include a method blank, a laboratory control sample, and the matrix spike/matrix spike duplicate analysis. If a target parameter is outside the method limits, every sample that is effected is flagged with the appropriate qualifier in Appendix B of the analytic report.

Method Blank - an aliquot of reagent water carried through the entire analytic process. The method blank results indicate if any possible contamination exposure during the sample handling, digestion or extraction process, and analysis. Concentrations of target analytes above the reporting limit in the method blank are qualified with the "B" qualifier.

Laboratory Control Sample - is a sample of known concentration that is carried through the digestion/extraction and analysis process. The percent recovery, expressed as a percentage of the theoretical concentration, has statistical control limits indicating that the analytic process is "in control". If a target analyte is outside the control limits for the laboratory control sample or any other control sample, the parameter is flagged with a "J4" qualifier for all effected samples.

Matrix Spike and Matrix Spike Duplicate - is two aliquots of an environmental sample that is spiked with known concentrations of target analytes. The percent recovery of the target analytes also has statistical control limits. If any recoveries that are outside the method control limits, the sample that was selected for matrix spike/matrix spike duplicate analysis is flagged with either a "J5" or a "J6". The relative percent difference (%RPD) between the matrix spike and the matrix spike duplicate recoveries is all calculated. If the RPD is above the method limit, the effected samples are flagged with a "J3" qualifier.

