# **2017 ANNUAL MONITORING REPORT**

## FAI – HYDRANT FUEL SYSTEM SITE FAIRBANKS INTERNATIONAL AIRPORT, ALASKA



ADEC FILE NO.: 100.38.128 ADEC HAZARD IDENTIFICATION NO.: 23140

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### **ACRONYMS AND ABBREVIATIONS**

°C	degrees Celsius
°F	degrees Fahrenheit
-dup	duplicate sample designation
AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
AFCEE	(U.S.) Air Force Center for Engineering and the Environment
ARFF	aircraft rescue and firefighting
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylenes
btoc	below top of casing
сос	contaminant of concern
CV	coefficient of variation
DOT&PF	Department of Transportation and Public Facilities (Alaska)
DRO	diesel-range organics
ELAP	Environmental Laboratory Accreditation Program
FAI	Fairbanks International Airport
GCL	groundwater cleanup level
GRO	gasoline-range organics
IDW	investigation derived waste
LCS	laboratory control spike
LCSD	laboratory control spike duplicate
LNAPL	light non-aqueous phase liquid
LOD	limit of detection
LOQ	limit of quantitation
mg/L	milligrams per liter
mg/kg	milligrams per kilogram
MW	monitoring well
Ν	Number
ND	non-detect (above the limit of detection)
NFRAP	no further remedial action planned
NS	not sampled
QEP	qualified environmental professional
R&M	R&M Consultants, Inc.
ROD	record of decision
RPD	relative percent difference
SCL	soil cleanup level
SGS	SGS North America, Inc.
toc	top of casing
USGS	U.S. Geological Society

### **EXECUTIVE SUMMARY**

Groundwater monitoring activities were conducted on 5 through 7 September 2017 by R&M Consultants, Inc. (R&M) at Fairbanks International Airport (FAI) Hydrant Fuel System Site (Site) in Fairbanks. Monitoring included collecting groundwater samples from four monitoring wells, taking free product measurements in two monitoring wells, and decommissioning three monitoring wells. Groundwater samples were analyzed for gasoline-range organics (GRO), diesel-range organics (DRO), and benzene, toluene, ethylbenzene, and xylenes (BTEX). Annual monitoring for 2017 was based on the 2016 Work Plan and 2006 Record of Decision (ROD).

#### BACKGROUND

The Site was initially investigated in the late 1990s to characterize and delineate soil and groundwater contamination resulting from fuel releases from the eastern (distribution) portion of the hydrant fueling pipeline. The ROD stipulated long-term groundwater monitoring for Site contaminants of concern, selected site specific cleanup levels, presented an exposure pathway evaluation, and listed a number of requirements.

#### **GROUNDWATER CHEMICAL RESULTS**

Groundwater results are summarized in Table ES-1.

	<b>a</b> 11	Benzene	Toluene	Ethylbenzene	Total Xylenes	GRO	DRO		
Well Identification	Sampling Date	Cleanup Level (mg/L)							
lacineación	Dutt	0.0046	1.1	0.015	0.19	2.2	1.5		
MW-1R	9/6/2017	0.000250 U	0.000500 U	0.000500 U	0.00150 U	0.0602 J, QN	0.933		
MW-1R (duplicate)	9/6/2017	0.000250 U	0.000500 U	0.000500 U	0.00150 U	0.0384 J, QN	0.830		
MW-15	9/7/2017	0.000320 J	0.000500 U	0.0615	0.452	1.27 MH, QN	1.20		
MW-18	9/6/2017	0.0563	0.0138	0.245	1.85	4.35 MH, QN	12.4		
MW-25	Not sampled, well destroyed								
MW-30R	9/6/2017	0.000250 U	0.000500 U	0.000500 U	0.00150 U	0.0500 U, QN	1.29		

 TABLE ES-1: 2017 SUMMARIZED GROUNDWATER RESULTS

NOTES:

J-flag = estimated value as the detection was below the limit of quantitation but above the limit of detection.

U-flag = non-detect above the limit of detection (in parentheses).

MH-flag = Estimated value with a high bias due to matrix effect.

QN-flag = Estimated value with an unknown bias due to quality control failures.

mg/L = milligrams per liter.

Results exceeding a cleanup level are highlighted in red and are BOLD.

Site specific cleanup levels were designated in the 2006 ROD and updated by changes to 18 Alaska Administrative Code (AAC) 75.

#### CONCLUSIONS

Groundwater results from 2017 and previous sampling events appear to show overall decreasing trends (Mann-Kendall analysis) in samples from the monitoring well network; although results are still above GCLs. Overall, COC detections appear to be decreasing across the Site with at least one COC exceeding a GCL in MW-15 or MW-18 with the exception of toluene.

The monitoring well network has been affected due to well damage since the 2013 sampling event with the loss of monitoring wells MW-25 and MW-35. Loss of monitoring well MW-35 appears to be of limited effect since MW-34 is still intact and MW-35 is located down to cross-gradient. Loss of MW-25 effects analysis of results as it has consistently remained above cleanup levels and is located near a low point in the fuel hydrant system used as a drain.

#### RECOMMENDATIONS

R&M provides the following recommendations for the Site:

- Complete decommissioning of monitoring well MW-25 in accordance with ADEC Monitoring Well Guidance by removing the well casing or over drilling.
- Re-survey monitoring wells MW-1R, MW-30R, and MW-34 to re-establish elevations.
- Investigate the use of MW-5 and/or MW-2 as replacements for MW-25 in the monitoring network as part of 2019 annual sampling.
- Continue biannual sampling of the monitoring network in coordination with ADEC. Future sampling events should occur in the fall of odd numbered years until ADEC concludes that monitoring is no longer necessary.

### **1.0** INTRODUCTION

The Alaska Department of Transportation and Public Facilities (DOT&PF) Fairbanks International Airport (FAI) retained R&M Consultants, Inc. (R&M) to perform groundwater monitoring activities at the Hydrant Fuel System contaminated site (File No: 100.38.128 and Hazard ID: 23140) under the Innovative Term Agreement for FAI Environmental Services 2016, Notice-to-Proceed Number P1-1, Agreement Number 025-6-1-041. Groundwater monitoring requirements for the Hydrant Fuel System (Site) are stipulated in the Record of Decision, ADOT&PF Fairbanks International Airport Hydrant Fuel System – Distribution Line (ADEC, 2006) and have been modified per recommendations in the 2013 Fuel Hydrant System Site Groundwater Monitoring Report – Final (ERM, 2014), approved by the Alaska Department of Environmental Conservation (ADEC) in 2015. This investigation was performed in accordance with the ADEC approved Work Plan (R&M, 2016).

### **1.1** INVESTIGATION OBJECTIVES

The primary project objectives of 2017 Hydrant Fuel System Site (Site) groundwater monitoring were to measure concentrations of site contaminants of concern (COC) in groundwater for comparison with results from previous groundwater monitoring events, and to maintain or decommission out of use monitoring wells. The Site location and select site features are shown on **Drawings A-01 and A-02.** Field investigation objectives included the following items:

- Conduct groundwater monitoring including the collection of analytical groundwater samples and field screening for light non-aqueous phase liquid (LNAPL).
- Perform monitoring well maintenance and decommissioning.
- Perform data validation and analysis including the Mann-Kendall analysis for trend evaluation.
- Document field activities and results in a final report submitted to ADEC.

#### **1.2 BACKGROUND AND REGULATORY FRAMEWORK**

The Site was initially investigated in the late 1990s to characterize and delineate soil and groundwater contamination resulting from fuel releases from the eastern, or distribution, portion of the hydrant fueling pipeline. Site COCs include gasoline-range organics (GRO); diesel-range organics (DRO); and benzene, toluene, ethylbenzene, and xylene (BTEX) compounds. The identified release locations include a low-point drain, valve pit #1, and valve pit #2 (Drawing A-02). Investigation details and characterization information for the Site are contained in the Expedited Site Assessment/Release Investigation Report, Fairbanks International Airport Fuel Hydrant Distribution System (OASIS, 1999).

Product recovery of LNAPL was performed at six wells from 2000 to 2002. Several LNAPL recovery methods were employed at the Site including skimming, passive recovery, and vacuum enhanced recovery. Total LNAPL recovery declined from 135 gallons in 2000 to 10 gallons in 2002. As a result, ADEC determined in 2003 that product recovery efforts were no longer practicable due to minimal recovery volume and supported termination of recovery efforts.

Groundwater monitoring and Site evaluation continued throughout the investigation and cleanup phases at the Site from 1999 through 2005. In 2005, FAI requested a No Further Remedial Action Planned (NFRAP) determination from ADEC. The NFRAP request was based on evaluation of the

Site using Bioscreen Natural Attenuation Decision Support System tools and the calculations of risk-based cleanup levels for the Site. ADEC completed a ROD for the Site in 2006 (ADEC, 2006), granting the NFRAP, and classified the Site as Cleanup Complete with Institutional Controls.

The ROD stipulated long-term groundwater monitoring for Site COCs, selected site specific cleanup levels, presented an exposure pathway evaluation, and listed a number of requirements. The ROD required implementation of several institutional controls and annual groundwater monitoring of three alternate point-of-compliance wells and four supplemental MWs. Supplemental MWs were included in the annual groundwater MW network to monitor COC concentrations adjacent to, and downgradient of, the release locations. ADEC also reserved the right to require additional action should new information become available that indicates increased risk to human health or the environment.

The ROD selected soil cleanup levels (SCL) and groundwater cleanup levels (GCL) based on 18 Alaska Administrative Code (AAC) 75: Method Two - Table B1, migration to groundwater for soil and Table C for groundwater. The SCL and GCL have been amended to reflect current ADEC cleanup levels (ADEC, 2017a). Site COCs and associated cleanup levels are presented in Table 1-1.

Contaminant of Concern	Soil Cleanup Level (mg/kg)	Groundwater Cleanup Level (mg/L)	
GRO	300	2.2	
DRO	250	1.5	
Benzene	0.022	0.0046	
Toluene	6.7	1.1	
Ethylbenzene	0.13	0.015	
Xylenes (total)	1.5	0.19	

NOTES:

mg/kg – milligrams per kilogram mg/L – milligrams per liter

Per the ROD, annual groundwater monitoring and related activities commenced from 2007 through 2013. Seven MWs (MW-1R, MW-15, MW-18, MW-22, MW-25, MW-29, and MW-30) were selected by the ROD to monitor for Site COCs. Monitoring wells MW-34, MW-35, and MW-36 are also monitored as sentry wells for free product. Several modifications have been made to the monitoring locations stipulated in the ROD due to FAI expansion projects, well integrity issues, and groundwater monitoring results. Monitoring location modifications are listed below.

- MW-22 was decommissioned in 2006 to allow expansion of the FAI passenger terminal.
- MW-29 and MW-30 were replaced with MW-29R and MW-30R, respectively in 2007 due to well integrity issues.
- Sampling of the replacement well MW-29R was discontinued in 2009 because analytical results for MW-29R were consistently below GCLs.
- MW-29R was inadvertently removed during construction activities in April, 2014.

In 2015, ADEC approved recommendations to reduce the groundwater monitoring frequency from annual to biennial and to decommission MW-4 (remained from initial investigation and remediation of the Site).

### **1.3 WORK PLAN DEVIATIONS**

Four deviations from the approved Work Plan (R&M, 2016) occurred during field activities.

- Monitoring well MW-4R was decommissioned by filling with bentonite chips, hydrating with potable water, and cutting off the casing below grade. The Work Plan specified decommissioning by removal. R&M coordinated with ADEC prior to mobilization to change decommissioning methods. ADEC approved decommissioning in place in accordance with ADEC Monitoring Well Guidance (ADEC, 2013).
- Monitoring well MW-25 was damaged due to frost jacking and impact at the surface. It was also plugged with debris. As a result, it was partially decommissioned (to the extent practicable with hand tools) and the surface plugged with concrete. The well was not sampled.
- Monitoring well MW-35 was damaged by surface activities. The casing was broken off at approximately 3 feet bgs and the remaining casing was plugged with soil to above the groundwater table. The rest of the casing was plugged with bentonite to approximately 3 feet bgs. The surface was backfilled with Site soils.
- Monitoring well MW-1R exhibited extremely slow recharge during purging and drawdown exceeded low flow guidelines of 0.3 feet. A pumping rate 0.25 liters per minute caused 3.24 feet of drawdown.

### **2.0** SETTING AND SITE CONDITIONS

The Site is located between the passenger terminals and the DOT&PF Aircraft Rescue and Fire Fighting (ARFF) and maintenance building on the northwest side of the airport. The Site is in Sections 23 and 24, Township 1 South, Range 2 West, USGS Quadrangle Fairbanks D-2 of the Fairbanks Meridian **Drawing A-01**. The Site is located at 64.813929 degrees north and 147.877652 degrees west in World Geodetic System 1984 decimal degree coordinates based on the ADEC Contaminated Sites Program database listing for file number 100.38.128. General Site and monitoring well locations are shown on **Drawing A-02**.

#### 2.1 TOPOGRAPHY AND SURFACE DRAINAGE

The Site is relatively flat, with little topographic relief.

#### **2.2 SURFACE DRAINAGE**

Surface drainage appears to occur via soil infiltration and sheet run-off. Soil infiltration appears to be the primary form of surface drainage near monitoring wells MW-34, MW-35, and MW-36. Areas around monitoring wells MW-1R, MW-15, MW-18, MW-25, and MW-30R are drained by sheet flow over pavement to adjacent unpaved areas and drainage ditches.

#### **2.3 GROUNDWATER CONDITIONS**

Groundwater appears to flow west-northwest across the Site based on past sampling events (ERM, 2014). Groundwater was observed at between 6.54 and 11.69 feet bgs during the 2017 sampling event.

### 2.4 CLIMATE

Based on climate data (1949 to 2012) recorded at the Fairbanks International Airport, Alaska (502968) weather station near the Site, the mean annual air temperature was 27 degrees Fahrenheit ( $^{\circ}$ F), with minimum and maximum monthly averages of approximately -10  $^{\circ}$ F (January) and 62  $^{\circ}$ F (July), respectively. The area received an average of 10.5 inches of precipitation per year, with a maximum monthly mean of approximately 1.9 inches in July (WRCC, 2017)

### **3.0** INVESTIGATION METHODS AND RESULTS

Groundwater chemical samples were collected according to procedures specified by the Work Plan (R&M, 2016), correspondence with ADEC, and ADEC Field Sampling Guidance (ADEC, 2016). Field notes are provided in **Appendix B** and sampling forms are provided in **Appendix C**. Christopher Fell of R&M was the ADEC qualified environmental professional (QEP) on site as required by 18 AAC 75 (ADEC, 2017a). Sampling activities occurred on 5 through 7 September 2017.

Chemical samples were submitted to SGS North America, Inc. in Anchorage, Alaska (SGS). SGS (UST-005, expires 18 December 2017) is an ADEC approved laboratory and is Environmental Laboratory Accreditation Program (ELAP) certified for the analytical methods used. Summary tables of the complete chemical results are included in **Appendix D**. Level 2 laboratory data reports are included in **Appendix E**. **Table 3-1** details the types of analyses performed by the analytical lab and the number of samples collected during this investigation.

Sampling Locations	Analysis	Number Primary Samples	Number Duplicate Samples	Total Number Samples	
MW-1R, MW-15, MW-18, and MW- 30R	GRO (AK101) DRO (AK102) BTEX (SW8021)	4	1	5	
MW-34 and MW-36	Observed for the presence of LNAPL				
MW-4, MW-25, and MW-35	No samples collected (wells were decommissioned)				

#### TABLE 3-1: ANALYTICAL SUITE AND SAMPLES BY LOCATION

NOTES:

For definitions, see the Acronyms and Abbreviations table.

Investigation observations and chemical results from the 2017 groundwater sampling event are discussed in detail in the following sections. Sampling locations are shown on **Drawing A-02**.

### **3.1** GROUNDWATER INVESTIGATION AND OBSERVATIONS

The nine monitoring wells identified in the Work Plan (R&M, 2016) had depth to groundwater and free product (if present) measured, sampled, repaired, or decommissioned. These include the five remaining monitoring wells (MW-22 was decommissioned in 2006) specified by the ROD, monitoring wells MW-34, MW-35, and MW-36 that are monitored as sentry wells, and monitoring well MW-4 that was decommissioned during this monitoring event. Two additional monitoring wells were decommissioned due to damage observed during field activities. Components of the 2017 monitoring event are discussed in the following sections.

#### 3.1.1 MONITORING WELL CONDITION ASSESSMENT

Initial site activities at each monitoring well involved a condition assessment which evaluated general well construction and performance along with the current status of monitoring wells, locks, plugs, and protective casings **(Table 3-2).** 

Monitoring Well Location	Date	Condition Notes	Action Items / Recommendations				
MW-1R	9/6/2017	Replaced the J-plug	Needs a lock Re-survey				
MW-2		Not assessed in 2017*					
MW-4	9/6/2017	Decommissioned during 2017 field activities.	None				
MW-5		Not assessed in 2017*					
MW-9		Not assessed in 2017*					
MW-10		Not assessed in 2017*					
MW-12		Not assessed in 2017*					
MW-15	9/7/2017	9/7/2017 Average, lock is missing.					
MW-18	9/6/2017	Average, lock is missing.	Needs a lock				
MW-25	9/7/2017	9/7/2017 Destroyed due to frost-jacking and subsequent damage by surface equipment. Decommissioned during 2017 field activities.					
MW-28		Not assessed in 2017*					
MW-29R	Not assessed in 2017*						
MW-30R	V-30R 9/6/2017 Replaced the flush mount and reconstructed the concrete surface seal. Cut down the well casing 0.4 feet.		Needs a lock Re-survey				
MW-33		Not assessed in 2017*					
MW-34	9/5/2017	9/5/2017 Replaced the flush mount.					
MW-35	9/5/2017	Destroyed by unknown activities. Broken off approximately 4 feet bgs. Decommissioned during 2017 field activities.	Replace to maintain the monitoring network				
MW-36	9/7/2017	Average, lock is missing.	Needs a lock				

#### TABLE 3-2: 2017 MONITORING WELL CONDITION NOTES

NOTES:

\*Monitoring wells not assessed in 2017 are excluded as they are not part of the current monitoring well network.

#### 3.1.2 MONITORING WELL DECOMMISSIONING AND MAINTENANCE

Monitoring wells MW-4 and MW-35 were decommissioned by filling the well casing with hydrated bentonite chips and cutting the casings off at approximately two and four feet bgs, respectively. The surface completions were removed and the surface repaired to match existing conditions. MW-25 was blocked near the surface with a red plastic pole that had been jammed into the well casing and then snapped off at approximately 1.9 feet below the top of the casing. The casing was cut off approximately 0.5 feet below surface and the top 1.4 feet were filled with bentonite and then hydrated. The surface completion was removed and the pavement was patched with concrete.

Surface completions were repaired for monitoring wells MW-30R and MW-34. New flush mounts were installed and set based on existing surface conditions. The surface monument at MW-30R was set in concrete and recessed to prevent damage during snow clearing operations in winter. The MW-30R well casing was cut down approximately 0.5 feet due to frost jacking. The surface monument at MW-34 was set by backfilling around it with existing soil as it is located in a grassy area just off the road shoulder.

Monitoring wells MW-1R, MW-30R, and MW-34 should be re-surveyed to re-establish elevations due to frost jacking. MW-25 may be replaced by installing a new monitoring well at that location or by investigating use of MW-2 or MW-5 as a replacement. MW-25 was not decommissioned in accordance with ADEC guidance (ADEC, 2013) due to the blockage in the casing.

#### 3.1.3 MONITORING WELL PURGING AND SAMPLING

An oil/water interface probe was used to measure depth to groundwater and the thickness of free product, if present. Free product was possibly detected in MW-18 based on the interface probe reading at 0.01 feet thick. The effective solubility of BTEX constituents also indicate the presence of diesel-based free product.

Monitoring wells MW-1R, MW-15, MW-18, and MW-30R were purged until four water quality parameters had stabilized for at least four consecutive readings (ADEC, 2016). Readings collected with a YSI 556 equipped with a flow-through cell are provided on groundwater sampling/purging data forms included in **Appendix C**; monitoring wells were sampled immediately following water quality parameter stabilization. New Teflon-lined tubing was used with a peristaltic pump and a section of silicon tubing through the pump head to collect samples. Samples were collected by removing the flow-through cell from the sampling set-up to minimize chances of cross-contamination or volatile loss. Groundwater samples were analyzed for BTEX, GRO, and DRO **(Table 3-1).** 

Purge volumes were based on the results of water quality parameter measurements, current water level measurements, and casing depths measured in previous years. Well casings were sounded using the water level indicator to measure current total depth after collection of samples to prevent agitation of any sediment located at the bottom of the well casing.

Samples for all wells were collected into laboratory provided glassware and immediately placed in pre-chilled coolers following collection and labeling. Chemical results are discussed in **Section 3.2.** Observations from each monitoring well are tabulated in **Table 3-3** and groundwater elevation readings from between 1999 to 2017 are provided in **Tables 3-4 to 3-9**, as available.

Monitoring Well Location	Sheen	Odor	Free Product Thickness (feet)	Water Color (Purge Start)	Water Color (Purge End)		
MW-1R	None	None	None	Very light yellow	Very light yellow		
MW-15	None	None	None	Clear	Clear		
MW-18	MW-18 Slight sheen		0.01	Very light yellow	Clear		
MW-25	Well destroyed, no observations made						
MW-30R	MW-30R None		None	Light yellow	Light yellow		
MW-34	MW-34 Not observed		None	Not observed			
MW-35	Well destroyed, no observations made						
MW-36	Not observed	Not observed None None Not observed			served		

### **3.2 GROUNDWATER CHEMICAL RESULTS**

GRO was detected in monitoring wells MW-1R and MW-15 at concentrations below the 2.2 mg/L cleanup level and exceeded the cleanup level in monitoring well MW-18 at a concentration of 4.35 mg/L.

DRO was detected in monitoring wells MW-1R, MW-15, and MW-30R at concentrations below the 1.5 mg/L cleanup level and exceeded the cleanup level in monitoring well MW-18 at a concentration of 12.4 mg/L.

BTEX were non-detect in monitoring wells MW-1R and MW-30R. Benzene was detected below the 0.0046 mg/L cleanup level in MW-15 and exceeded the cleanup level at a concentration of 0.0563 mg/L in MW-18. Toluene was only detected in monitoring well MW-18 at a concentration of 0.0138 mg/L, which was below the 1.1 mg/L cleanup level. Ethylbenzene was detected above the 0.015 mg/L cleanup level in monitoring wells MW-15 and MW-18 at concentrations of 0.0615 and 0.245 mg/L, respectively. Total xylenes were detected above the 0.19 mg/L cleanup level in monitoring wells MW-15 and 1.85 mg/L, respectively.

Summarized groundwater results from 2017 are provided in **Tables 3-10 through 3-13**. Complete chemical results from the 2017 sampling event are provided in **Appendix D**, **Appendix E**, and in previous reports for data from 1999 to 2016 (ERM, 2014).

Monitoring Well Location	Date	Top of Casing (toc) Elevation (feet)	Depth to Groundwater (feet btoc)	Groundwater Elevation (feet)	Free Product Thickness (feet)
	9/6/2017	434.65	11.12	423.53	
	3/11/2014	434.65	13.21	421.44	
	12/3/2013	434.65	13.74	420.91	
	6/14/2013	434.76	10.84	423.92	
	5/21/2013	434.76	13.08	421.68	
	3/21/2013	434.76	13.98	420.78	
MW-1R	10/12/2012	434.76	12.29	422.47	
	10/12/2011	434.76	12.63	422.13	
	10/1/2010	434.76	11.51	423.25	
	9/14/2009	434.76	11.53	423.23	
	10/20/2008	434.76	12.81	421.95	
	10/7/2007	434.76	11.83	422.93	
	8/28/2006	434.76	9.91	424.85	

#### TABLE 3-4: MONITORING WELL MW-1R CURRENT AND HISTORIC GROUNDWATER ELEVATIONS

NOTES:

For definitions, see the Acronyms and Abbreviations table. Data from the current year are **BOLD**. Data from 2006 to 2014 are after ERM, 2014.

Monitoring Well Location	Date	Top of Casing (toc) Elevation (feet)	Depth to Groundwater (feet btoc)	Groundwater Elevation (feet)	Free Product Thickness (feet)
	9/7/2017	435.17	11.69	423.48	
	3/11/2014	435.17	14.26	420.91	
	12/3/2013	435.17	13.79	421.38	
	6/14/2013	435.30		Frozen	
	5/21/2013	435.30	13.63	421.67	
	3/21/2013	435.30	14.50	420.80	
	10/12/2012	435.30	12.79	422.51	
	10/12/2011	435.30	13.11	422.19	
	10/1/2010	435.30	12.02	423.28	
	9/14/2009	435.32	12.08	423.24	
MW-15	10/20/2008	435.32	13.33	421.99	
	10/7/2007	435.32	12.43	422.89	
	8/28/2006	435.32	10.47	424.85	
	7/27/2005	435.32	8.94	426.38	
	8/27/2004	435.33	9.71	425.62	
	8/27/2003	435.33	9.38	425.95	
	8/14/2002	435.33	9.61	425.72	
	9/28/2001	435.33	11.96	423.37	
	9/23/1999	435.33	12.31	423.02	
	8/9/1999	435.33	10.16	425.17	

#### TABLE 3-5: MONITORING WELL MW-15 CURRENT AND HISTORIC GROUNDWATER ELEVATIONS

NOTES:

For definitions, see the Acronyms and Abbreviations table. Data from the current year are **BOLD**. Data from 1999 to 2014 are after ERM, 2014.

Monitoring Well Location	Date	Top of Casing (toc) Elevation (feet)	Depth to Groundwater (feet btoc)	Groundwater Elevation (feet)	Free Product Thickness (feet)
	9/6/2017	435.15	11.36	423.79	0.01
	3/11/2014	435.15	14.55	420.60	0.40
	12/3/2013	435.15	13.89	421.26	0.24
	6/14/2013	435.26		Frozen	
	5/21/2013	435.26	6.41	428.85	
	3/21/2013	435.26	16.26	419.00	2.17
	10/12/2012	435.26	12.91	422.35	0.25
	10/12/2011	435.26	13.22	422.04	0.30
	10/1/2010	435.26	11.90	423.36	
	9/14/2009	435.28	11.99	423.29	
MW-18	10/20/2008	435.28	13.20	422.08	
	10/8/2007	435.28	12.31	422.97	0.01
	8/28/2006	435.28	10.42	424.86	
	7/27/2005	435.28	8.78	426.50	
	8/27/2004	435.34	9.68	425.66	
	8/27/2003	435.34	9.63	425.71	
	8/14/2002	435.34	9.58	425.76	
	9/28/2001	435.34	11.84	423.50	
	9/12/2000	435.34	10.13	425.21	
	9/23/1999	435.34	12.22	423.12	
	8/9/1999	435.34	10.22	425.12	

#### TABLE 3-6: MONITORING WELL MW-18 CURRENT AND HISTORIC GROUNDWATER ELEVATIONS

#### NOTES:

For definitions, see the Acronyms and Abbreviations table. Data from the current year are **BOLD.** Data from 1999 to 2014 are after ERM, 2014.

Monitoring Well Location	Date	Top of Casing (toc) Elevation (feet)	Depth to Groundwater (feet btoc)	Groundwater Elevation (feet)	Free Product Thickness (feet)
	9/7/2017		Partially Deco	ommissioned	
	3/11/2014	Not Surveyed	12.65	Not Surveyed	
	12/3/2013	Not Surveyed	12.09	Not Surveyed	
	6/14/2013	433.52		Frozen	
	5/21/2013	433.52		Frozen	
	3/21/2013	433.52		Frozen	
	10/12/2012	433.52	11.14	422.38	
	10/12/2011	433.52	11.51	422.01	
	10/1/2010	433.52	10.38	423.14	
	9/14/2009	433.49	10.39	423.10	
MW-25	10/21/2008	433.49	11.50	421.99	
	10/7/2007	433.49	10.67	422.82	
	8/28/2006	433.49	7.46	426.03	
	7/27/2005	433.49	7.17	426.32	
	8/27/2004	433.32	7.92	425.40	
	8/27/2003	433.32	7.80	425.52	
	8/14/2002	433.32	7.62	425.70	
	9/27/2001	433.32	10.11	423.21	
	9/12/2000	433.32	8.30	425.02	
	9/23/1999	433.32	10.40	422.92	
	8/9/1999	433.32	8.11	425.21	

#### TABLE 3-7: MONITORING WELL MW-25 CURRENT AND HISTORIC GROUNDWATER ELEVATIONS

#### NOTES:

For definitions, see the Acronyms and Abbreviations table. Data from the current year are **BOLD**. Data from 1999 to 2014 are after ERM, 2014.

Monitoring Well Location	Date	Top of Casing (toc) Elevation (feet)	Depth to Groundwater (feet btoc)	Groundwater Elevation (feet)	Free Product Thickness (feet)
	9/6/2017	433.44	8.74	424.70	
	5/5/2014	433.44		Frozen	
	3/11/2014	433.44		Frozen	
	12/3/2013	433.44		Frozen	
	6/14/2013	433.60		Frozen	
	5/21/2013	433.60		Frozen	
MW-30R	3/21/2013	433.60	13.23	420.37	
	10/12/2012	433.60	9.89	423.71	
	10/12/2011	433.60	10.30	423.30	Trace
	10/1/2010	433.60	9.16	424.44	
	11/6/2009	Not Surveyed		Frozen	
	10/20/2008	Not Surveyed	9.90	Not Surveyed	
	10/7/2007	Not Surveyed	9.23	Not Surveyed	

#### TABLE 3-8: MONITORING WELL MW-30R CURRENT AND HISTORIC GROUNDWATER ELEVATIONS

NOTES:

For definitions, see the Acronyms and Abbreviations table. Data from the current year are **BOLD**. Data from 2007 to 2014 are after ERM, 2014.

Monitoring Well Location	Date	Top of Casing (toc) Elevation (feet)	Depth to Groundwater (feet btoc)	Groundwater Elevation (feet)	Free Product Thickness (feet)
	9/5/2017	430.00	6.54	423.46	
	3/11/2014	430.00	9.34	420.66	
	6/14/2013	429.99	6.40	423.59	
MW-34	5/21/2013	429.99	8.75	421.24	
	3/21/2013	429.99	9.66	420.33	
	10/12/2012	429.99	8.04	421.95	
	10/12/2011	429.99	8.46	421.53	
	9/5/2017		Decomm	nissioned	<u>.</u>
	5/5/2014	429.89	8.91	420.98	
	3/11/2014	429.89	9.38	420.51	
	12/5/2013	429.89	8.46	421.43	
MW-35	11/15/2010	429.54		No Measurement	
	11/2/2010	430.01	9.35	420.66	
	10/21/2008	429.55	8.15	421.40	
	9/27/2005	429.55	5.47	424.08	
	9/7/2017	430.43	7.33	423.10	
	3/11/2014	430.43	9.78	420.65	
	6/14/2013	430.57	6.77	423.80	
MW-36	5/21/2013	430.57	9.05	421.52	
	3/21/2013	430.57	10.01	420.56	
	10/12/2012	430.57	8.35	422.22	
	10/12/2011	430.57	8.71	421.86	

#### TABLE 3-9: MONITORING WELLS MW-34, MW-35, AND MW-36 CURRENT AND HISTORIC GROUNDWATER ELEVATIONS

NOTES:

For definitions, see the Acronyms and Abbreviations table. Data from the current year are **BOLD**. Data from 2011 to 2014 are after ERM, 2014.

	TABLE 3-10: MONITORING WELLS MWV-1, MWV-1R, AND MWV-15 SUMMARIZED GROUNDWATER RESULTS								
Monitoring Well ID	Sampling Date	Benzene (mg/L)	Toluene (mg/L)	Ethylbenzene (mg/L)	Total Xylenes (mg/L)	GRO (mg/L)	DRO (mg/L)		
Cleanup Levels		0.0046	1.1	0.015	0.19	2.2	1.5		
MW-1	7/29/1997	0.0201	0.163	0.696	4.75	NS	NS		
MW-1	8/19/1998	ND (0.0200)	0.121	0.605	4.50	NS	NS		
MW-1	8/6.1999	0.0112	0.101	0.522	4.35	12.0	13.8		
MW-1R	7/27/2005	ND (0.0005)	0.0100	ND (0.0020)	0.02297	0.262	41.7		
MW-1R	8/28/2006	ND (0.0005)	ND (0.0020)	0.0470	0.155	1.01	6.64		
MW-1R	10/7/2007	ND (0.0005)	ND (0.0005)	0.0087	0.0449	0.446	8.17		
MW-1R	10/20/2008	ND (0.0005)	ND (0.0005)	0.0198	0.0433	0.368	29.8		
MW-1R	9/14/2009	ND (0.0005)	ND (0.0010)	0.0320	0.00626	0.277	7.89		
MW-1R	10/1/2010	ND (0.0005)	ND (0.0020)	0.0055	0.0294	0.313	21.6		
MW-1R	10/12/2011	ND (0.0005)	ND (0.0010)	0.00377	0.0112	0.291	32.6		
MW-1R	10/12/2012	ND(0.300)	ND (0.620)	0.00163	0.00357 J	0.141	14.7 J,M		
MW-1R	12/3/2013	ND (0.00025)	ND (0.0005)	0.00251	0.00237 J	0.129	2.41		
MW-1R	0/6/2017	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	0.0602 J	0.933		
MW-1R-Dup	9/6/2017	ND (0.00025)	ND (0.0005)	ND (0.0005)	ND (0.0005)	0.0384 J	0.830		
MW-15	8/12/1999	0.000949	ND (0.0020)	0.00816	0.0192	ND (0.0900)	1.64		
MW-15	9/28/2001	0.0360	0.00731	0.325	1.45	4.93	2.56		
MW-15	8/14/2002	0.0159	ND (0.0020)	0.217	0.413	2.00	1.56		
MW-15	8/27/2003	0.0143	ND (0.0400)	0.135	0.451	ND (1.8)	1.27		
MW-15	8/27/2004	0.0104	ND (0.0020)	0.103	0.240	1.15	0.81		
MW-15	7/27/2005	0.00542	0.00183	0.0851	0.150	0.674	0.443		
MW-15	8/28/2006	0.0112	0.00292	0.127	0.335	1.44 J	1.42		
MW-15	10/7/2007	ND (0.0100)	ND (0.0100)	0.170	1.05	4.42	2.91		
MW-15	10/20/2008	ND (0.0100)	ND (0.0100)	0.192	1.15	3.80	5.53		
MW-15	9/14/2009	ND (0.005)	ND (0.0100)	0.0913	0.452	2.86	2.23		
MW-15	10/1/2010	0.00325	ND (0.0020)	0.137	0.537	1.53 J	2.47		
MW-15-Dup	10/1/2010	0.00331	ND (0.0020)	0.145	0.569	1.61 J	NS		
MW-15	10/12/2011	0.00397	ND (0.0010)	0.177	0.741	2.39 J,S	5.67		
MW-15	10/12/2010	0.00227	0.00109	0.0654	0.274	0.89 J,S	1.68		
MW-15	12/3/2013	0.00171	ND (0.0005)	0.0664	0.259	1.22	1.52		
MW-15	9/6/2017	0.000320 J	ND (0.0005)	0.0615	0.452	1.27	1.20		

#### TABLE 3-10: MONITORING WELLS MW-1, MW-1R, AND MW-15 SUMMARIZED GROUNDWATER RESULTS

#### NOTES:

For definitions, see the Acronyms and Abbreviations table. Data from the current year are italicized. Data flag definitions are provided in the chemical data summary in **Appendix D**.

Results exceeding a cleanup level are highlighted in red and are **BOLD**.

Data from 1997 to 2013 are after ERM, 2013.

	TABLE 3-11: MONITORING WELL MW-18 SUMMARIZED GROUNDWATER RESULTS										
Monitoring Well ID	Sampling Date	Benzene (mg/L)	Toluene (mg/L)	Ethylbenzene (mg/L)	Total Xylenes (mg/L)	GRO (mg/L)	DRO (mg/L)				
Cleanup Levels		0.0046	1.1	0.015	0.19	2.2	1.5				
MW-18	8/12/1999	0.252	0.0679	0.559	2.60	7.70	7.41				
MW-18	9/20/2000	0.231	0.343	0.572	2.51	8.56	6.95				
MW-18	9/28/2001	0.261	0.0504	0.615	2.91	6.12	6.26				
MW-18	8/14/2002	0.186	0.0324	0.788	3.75	11.9	4.41				
MW-18	8/27/2003	0.115	ND (0.0400)	0.286	1.60	4.21	9.68				
MW-18	8/27/2004	0.191	0.0302	0.455	2.44	7.60	5.00				
MW-18	7/27/2005	0.193	ND (0.1000)	0.345	2.47	6.28	8.84				
MW-18	8/28/2006	0.174	0.0160	0.200	2.32	5.75 J	5.14				
MW-18	10/8/2007	0.091	ND (0.0100)	0.126	1.85	6.69	2.94				
MW-18	10/20/2008	0.125	ND (0.0100)	0.179	1.95	6.02	3.12				
MW-18	9/14/2009	0.0170	ND (0.0100)	0.042	0.045	2.53	2.36				
MW-18	10/1/2010	0.0601	0.00420	0.113	1.43	3.05	1.98				
MW-18	10/12/2011	0.207	0.00780	0.207	2.46	4.79	5.04				
MW-18	10/12/2012	0.157	0.0143	0.219	1.97	4.88	4.28				
MW-18	12/2/2012	0.0566	0.0064 J	0.165	1.72	6.46	11.3				
MW-18-Dup	12/3/2013	0.610	0.00652 J	0.171	1.81	6.75	13.1				
MW-18	9/6/2017	0.0563	0.0138	0.245	1.85	4.35	12.4				

#### TABLE 2 11. MONITODING WELL MW 19 SUMMAADIZED COOLINDWATED DESULTS

#### NOTES:

For definitions, see the Acronyms and Abbreviations table. Data from the current year are italicized.

Data flag definitions are provided in the chemical data summary in Appendix D.

Results exceeding a cleanup level are highlighted in red and are **BOLD**. Data from 1999 to 2013 are after ERM, 2014.

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				5 SUMMARIZED GRO			
Monitoring	Sampling	Benzene	Toluene	Ethylbenzene	Total Xylenes	GRO	DRO
Well ID	Date	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
Cleanup Levels		0.0046	1.1	0.015	0.19	2.2	1.5
MW-25	8/12/1999	0.182	0.0235	0.457	1.42	NS	NS
MW-25-Dup	8/12/1999	0.194	0.0216	0.476	2.38	6.11	5.09
MW-25	9/18/2000	0.185	0.0398	ND (0.419)	2.06	6.42	3.13
MW-25-Dup	9/18/2000	0.184	0.418	0.0348	1.94	6.51	3.15
MW-25	9/27/2001	0.204	0.217	0.541	0.300	12.2	3.90
MW-25-Dup	9/27/2001	0.259	0.231	0.658	3.56	NS	NS
MW-25	8/15/2002	0.205	0.0839	0.588	3.25	8.54	6.49
MW-25-Dup	8/15/2002	0.205	0.0839	0.588	3.25	8.54	6.49
MW-25	8/27/2003	0.258	0.264	0.617	3.68	8.58	5.35
MW-25-Dup	8/27/2005	0.261	0.272	0.599	3.56	8.40	4.94
MW-25	8/27/2004	0.207	0.138	0.535	3.09	9.60	6.27
MW-25-Dup	8/27/2004	0.223	0.151	0.576	3.30	10.6	5.94
MW-25	7/27/2005	0.141	0.00647	0.406	2.24	5.90	5.66
MW-25-Dup	7/27/2005	0.150	0.00692	0.434	2.39	6.38	5.54
MW-25	8/28/2006	0.0321 J	ND (0.2000)	0.477	5.00	17.0	111
MW-25	10/7/2007	0.139	0.0873	0.588	3.04	10.7	7.4
MW-25	10/21/2008	0.145	0.0608	0.597	3.52	10.2	6.06
MW-25	9/14/2009	0.102	0.066	0.652	4.20	22.4	5.34
MW-25-Dup	9/14/2009	0.102	0.0705	0.674	4.30	23.6	5.49
MW-25	10/1/2010	0.102	0.0409	0.518	3.40	6.81	5.40
MW-25-Dup	10/1/2010	NS	NS	NS	NS	NS	5.42
MW-25	10/12/2011	0.104	0.0597	0.640	3.97	7.79	5.02
MW-25-Dup	10/12/2011	0.100	0.0537	0.610	3.76	7.37	5.89
MW-25	10/12/2012	0.0797	0.0195	0.501	3.32	7.83	3.35
MW-25-Dup	10/12/2012	0.0831	0.0211	0.506	3.35	7.84	2.72
MW-25	12/3/2013	0.0566	0.0144	0.500	3.74	11.6	2.78
MW-25	9/6/2017	NS	NS	NS	NS	NS	NS

#### TABLE 3-12: MONITORING WELL MW-25 SUMMARIZED GROUNDWATER RESULTS

NOTES:

For definitions, see the Acronyms and Abbreviations table. Data from the current year are italicized.

Data flag definitions are provided in the chemical data summary in Appendix D.

Results exceeding a cleanup level are highlighted in red and are **BOLD**.

Data from 1999 to 2013 are after ERM, 2014.

	TABLE 3-13: MONITORING WELLS MW-30 AND MW-30R SUMMARIZED GROUNDWATER RESULTS									
Monitoring Well ID	Sampling Date	Benzene (mg/L)	Toluene (mg/L)	Ethylbenzene (mg/L)	Total Xylenes (mg/L)	GRO (mg/L)	DRO (mg/L)			
Cleanup Levels		0.0046	1.1	0.015	0.19	2.2	1.5			
MW-30	9/18/2000	ND (0.0005)	ND (0.0020)	ND (0.0020)	ND (0.0020)	ND (0.0900)	3.17			
MW-30	8/28/2006	NS	NS	NS	NS	NS	NS			
MW-30R	10/7/2007	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0015)	ND (0.0500)	2.35			
MW-30R	10/20/2008	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0015)	ND (0.0500)	1.75			
MW-30R	9/14/2009	NS	NS	NS	NS	NS	NS			
MW-30R	10/1/2010	ND (0.0005)	ND (0.0020)	ND (0.0020)	ND (0.0020)	ND (0.100)	1.75			
MW-30R	10/12/2011	ND (0.0005)	ND (0.0010)	ND (0.0010)	ND (0.0030)	ND (0.100)	3.96			
MW-30R	10/12/212	0.00024 J	ND (0.620)	ND (0.620)	0.00147 J	ND (0.0620)	2.15			
MW-30R	12/3/2013	NS	NS	NS	NS	NS	NS			
MW-30R	9/6/2017	ND (0.00025)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND(0.05)	1.29			

#### TABLE 3-13. MONITOPING WELLS MW-30 AND MW-30R SLIMMAPIZED GROUNDWATER RESULTS

#### NOTES:

For definitions, see the Acronyms and Abbreviations table. Data from the current year are italicized. Data flag definitions are provided in the chemical data summary in **Appendix D**.

Results exceeding a cleanup level are highlighted in red and are **BOLD**.

Data from 2000 to 2013 are after ERM, 2014.

#### **3.3 MANN-KENDALL ANALYSIS**

A Mann-Kendall analysis (Gilbert, 1987) was conducted during review of groundwater data collected between 1999 and 2017 for monitoring wells MW-1/MW-1R, MW-15, MW-18, MW-25, and MW-30/MW-30R. Data for all years in the range are not available for each well. Analysis was run for the years with data available. The following parameters were used for Mann-Kendall analysis:

- The data from available historical sampling results will be analyzed.
- Trend analysis will be performed per monitoring well and per analyte if the analyte was detected above the reporting limit at least two times within the data set.
- Filtering of data will not be allowed.
- The analysis requires at least four data points for valid results.
- Datasets with less than ten values use the test statistic S for datasets between 4 and 9 values.
- Datasets with ten or more values use the test statistic Z for trend determination and are calculated with the normal distribution.
- Positive test statistic S values indicate statistically increasing values with time, and negative test statistic S values indicate statistically decreasing values with time.
- Non-detect values will be set to half the value of the laboratory detection limit.
- Results will be presented as statistically significant increasing or decreasing trends, stable concentration trends, or indeterminate concentrations (no trend).
- A trend will be considered valid if the test statistic has a significance level of  $\alpha$  is less than 0.05, or a 95 percent probability  $(1 \alpha)$  or greater that the trend is not from a random distribution.

The Mann-Kendall analysis compares a later-measured value to each earlier-measured value and assigns the integer value of -1, o, or 1 indicating that the later value is lower, equal to, or higher than each earlier value, respectively. The Mann-Kendall analysis does not assume a distribution and is resistant to the influence of outliers.

The Mann-Kendall analysis assumes the null hypothesis of "no trend" unless the data indicate the alternative. If the probability, p, of obtaining the computed Mann-Kendall statistic (S) or Z statistic is less than 0.05 (or 5 percent), the significance level is greater than 95 percent. If p is less than 0.05, the null hypothesis is rejected and there is evidence to conclude that a trend exists. If the probability of obtaining S or Z is greater than 0.05 (p is less than 0.05), then the significance level is less than 95 percent and the null hypothesis is not rejected. If the significance level is greater than 95 percent, then the sign of the S value indicates the trend direction, with a positive S value indicating an increasing trend and a negative S value indicating a decreasing trend. A significance level of  $\alpha$  equals 0.05, or 5 percent was used by this analysis for trend determination.

The coefficient of variation (CV) for each data set was computed to determine the stability of the contaminants regardless of the trend. The CV value identifies the degree of variation in concentrations between sampling events and is defined as the sample standard deviation divided by the sample mean. The lower the value of the CV, the less variation exists and the more stable the concentration is over time. A benchmark CV value of one based on Table 3.2 in the Air Force Center for Environmental Excellence (AFCEE) document: Designing Monitoring Programs to Effectively Evaluate the Performance of Natural Attenuation was assigned for this analysis (AFCEE, 2000). For a negative S value with a significance level of less than 95 percent, a CV less than one

(CV is less than 1) indicates that the concentration at that location is stable, and CV is less than 1 indicates no trend.

A linear regression analysis was also performed on the data as a parametric alternative to supplement the Mann-Kendall analysis. The analysis assesses the slope and computes the R<sup>2</sup> value of the least-squares regression on the sample mean. The R<sup>2</sup> value indicates the fit of the data, or distance of data points from the regression line. Higher R<sup>2</sup> values (less than 0.8) indicate a close fit of the data to the regression line and a strong correlation, suggesting that there is a trend. Values of R<sup>2</sup> between 0.5 and 0.8 suggest some correlation in the data and the possibility of a trend. Values of R<sup>2</sup> less than 0.5 suggest there is likely no trend based on the linear regression. Linear regression is based on the assumption that the data approximately follow a normal distribution and can confidently be used with 8 or more data points. With fewer than 8 data points it is difficult to determine if the normality assumption has been met and the linear regression has low power, or a lower probability of correctly detecting a trend when a trend exists. Linear regressions are provided as a qualitative assessment of trend and offer a graphical context for the data, but should not be used for decision-making since the distribution of the data has not been determined.

Table 3-14 below provides a Mann-Kendall analysis summary for each analyte at each monitoringwell. Detailed Mann-Kendall analysis calculations and linear regressions are presented inAppendix G.

Monitoring Location	Number of Events (n)	Analyte	Mann- Kendall Statistic (S)	Z Statistic (unitless) / Significance Level (percent)	Mann-Kendall Trend	Comment	
		GRO	-39	3.36 / >99.9	Decreasing	None	
		DRO	-15	1.24 / 87.0	Decreasing		
MW-1/	11	Benzene	-26	1.64 / 95.0	Probable Decreasing	Linear trend is indeterminate	
MW-1R		Toluene	-36	2.30 / 98.9	Decreasing		
		Ethylbenzene	-54	3.48 / >99.9	Decreasing	None	
		Xylenes (total)	-66	4.27 / >99.9	Decreasing		
		GRO	1	0 / 50%	Indeterminate Trend	Linear regression is likely no trend	
		DRO	5	0.21 / 58.2	Likely No Trend	Linear trend is indeterminate	
MW-15	15	Benzene	-68	3.48 / >99.9	Decreasing	None	
10100 15	15	Toluene	-20	0.99 / 83.8	Likely No Trend	Linear regression is likely no trend	
		Ethylbenzene	-27	1.35 / 91.1	Probable Decreasing	Linear regression is likely no trend	
		Xylenes (total)	10	0.47 / 68.0	Likely No Trend	None	
		GRO	-41	1.87 / 97.0	Decreasing	Linear regression is likely no trend	
		DRO	-17	0.75 / 77.3	Stable	Linear and Mann-Kendall trends do not correlate.	
MW-18	16	Benzene	-63	2.90 / 95.0	Probable Decreasing	None	
		Toluene	-70	3.23 / >99.9	Decreasing	Linear regression is likely no trend	
		Ethylbenzene	-57	2.62 / 99.6	Decreasing	None	
		Xylenes (total)	-57	2.62 / 99.6	Decreasing	Linear regression is likely no trend	
		GRO	23	1.14 / 87.3	Likely No Trend	None	
		DRO	-5	0.21 / 58.2	Likely No Trend	Linear regression suggests a stable trend.	
MW-25	15	Benzene	-62	3.17 / >99.9	Decreasing		
		Toluene	-53	2.70 / 99.6	Decreasing	None	
		Ethylbenzene	10	0.47 / 68.0	Likely No Trend	None	
		Xylenes (total)	37	1.87 / 96.9	Increasing		
		GRO	-1	0 / 50	Probable Decreasing	Linear regression is likely no trend	
		DRO	-8	2.58 / 99.5	Decreasing		
MW-30/	7	Benzene	-11	3.69 / >99.9	Decreasing		
MW-30R	/	Toluene	1	0 / 50.0	Likely No Trend	None	
		Ethylbenzene	1	0 / 50.0	Likely No Trend		
		Xylenes (total)	1	0 / 50.0	Likely No Trend		

#### TABLE 3-14: MANN-KENDALL ANALYSIS SUMMARY

#### NOTES:

For definitions, see the Acronyms and Abbreviations table.

A negative S statistic indicates decreasing values over time and a positive S statistic indicates increasing values over time

A Z statistic of 1.645 corresponds to a significance level  $\alpha = 0.05$  or a 95 percent probability that a trend exists Increasing = statistically significant increasing trend (increasing concentration). Highlighted red.

Decreasing = statistically significant decreasing trend (decreasing concentration). Highlighted blue. Stable = Stable concentration. Significance of test statistic is less than 95 percent and coefficient of variation (CV) is less than 1. Indeterminate = No trend. Significance of test statistic is less than 95 percent and coefficient of variation (CV) is greater than 1.

#### **3.4** INVESTIGATION DERIVED WASTE

Investigation derived waste (IDW) consisted of purge and decontamination wastewater that were containerized in two 5-gallon buckets with sealed lids. Wastewater was disposed into the DOT&PF maintenance building oil-water separator in accordance with the ADEC approved Work Plan (R&M 2016).

### 4.0 QUALITY ASSURANCE/QUALITY CONTROL

Samples were collected by a QEP, as defined in 18 AAC 75 Oil and Other Hazardous Substances Pollution Control regulations (ADEC, 2017a). Data quality review was conducted to evaluate whether field measurements and analytical methods were performed according to method and project specifications and to qualify data affected by sample-handling or analytical anomalies.

Data quality review involved the evaluation of documentation and analytical reports associated with selected samples or groups of samples. Data review followed the ADEC Technical Memorandum on Data Quality Objectives, Checklists, Quality Assurance Requirements for Laboratory Data, and Sample Handling (ADEC, 2017b). Chemical data limit of detection (LOD) sensitivities were compared to the most stringent cleanup levels published in 18 AAC 75 (ADEC, 2017a). An ADEC checklist is included in **Appendix F**. Additional data qualifiers (flags) were added based on quality review of the data deliverables, as necessary. Possible data qualifiers are presented in **Table 4-1**.

Qualifier	Definition
J	Result refers to a concentration greater than the method detection limit but below the LOQ.
В	Indicates that the reported value is similar in concentration to the result of a related blank sample.
QH, QL, QN	Indicates that the reported result is estimated value (bias: high, low, unknown) due to a deficiency in related quality criteria.
MH, ML, MN	Indicates that the reported result is estimated value (bias: high, low, unknown) due to matrix interference.
R	Indicates that the reported result is inherently unreliable due to quality control deficiencies and is not recommended for project use.

#### TABLE 4-1: QUALIFIER DEFINITIONS

NOTES:

For definitions, see the Acronyms and Abbreviations table.

Samples were maintained at o to 6 degrees Celsius (°C) until delivery or shipment to the analytical laboratory. R&M delivered samples to SGS under strict chain-of-custody procedures. Laboratory check-in and holding time information are summarized in **Table 4-2**.

Analytical Laboratory	Analyzed Within Holding Time	ADEC Temperature Range (°C)	Check-In Temperature (°C)	Notes
SGS-Anchorage	Yes	0 to 6	4.8	GRO, DRO, and BTEX

#### TABLE 4-2: COOLER CHECK-IN AND HOLDING TIME INFORMATION

NOTES:

For definitions, see the Acronyms and Abbreviations table.

The following sections discuss quality assurance and quality control parameters for SGS laboratory report number 1178345 **(Appendix E)**. This report is applicable to all samples collected for the project. Refer to the checklist in **Appendix F** for further discussion.

### 4.1 PRECISION

Field duplicates must be collected at a rate of at least one per 10 primary field samples (10 percent), for each target analyte. One field duplicate was collected for four primary groundwater samples, a rate of 25 percent.

Laboratory control spike (LCS) and laboratory control spike duplicates (LCSD) recoveries were within acceptable ranges. Data quality or usability are not considered to be affected and data were not flagged.

### 4.2 ACCURACY

LCS and LCSD relative percent differences (RPD) were within acceptable ranges. Surrogate recoveries were within acceptable ranges for BTEX and DRO. Surrogate recovery for 4-bromofluorobenzene in AK101 analysis were above limits for samples FAI17-MW15 and FAI17-MW18 due to matrix interference. GRO results for the affected samples are flagged MH to indicate the potential high bias.

#### 4.3 **REPRESENTATIVENESS**

Samples were collected from appropriate matrices and locations to adequately characterize the media targeted for investigation as defined in the approved Work Plan (R&M, 2016). MW-25 could not be sampled due to damage, but this condition is not considered to affect data representativeness.

#### 4.4 COMPARABILITY

Field screening data such as odor or sheen related to results obtained by laboratory analysis of the target analytes.

#### 4.5 COMPLETENESS

All results for chemical data included with this report are considered usable.

#### 4.6 SENSITIVITY

The LODs were less than the regulatory cleanup levels for the target analytes.

Analyses of the trip blanks were non-detect or less than the limit of quantitation (LOQ) for the target analytes.

Analyses of laboratory method blanks were non-detect or less than the LOQs for the target analytes.

### 4.7 DATA FLAGS

Analysis of quality control samples resulted in the addition of MH and QN flags during review. GRO results for MW-15 and MW-18 are flagged MH due to a high bias from surrogate recovery

failure. GRO results are conservatively flagged QN due to a possible unknown bias from the primary-duplicate RPD failure, but it should be noted that the GRO results compared for RPD calculations were both J-flagged and are considered estimated.

### **5.0 CONCLUSIONS AND RECOMMENDATIONS**

Conclusions and recommendations based on data from 1999 to 2017 periodic sampling of the monitoring network at the FAI-Hydrant Fuel System Site are discussed in the following subsections.

### 5.1 CONCLUSIONS

Groundwater results from 2017 and previous sampling events appear to show overall decreasing trends (Mann-Kendall analysis) in samples from the monitoring well network; although results are still above GCLs. Overall, COC detections appear to be decreasing across the Site with at least one COC exceeding a GCL in MW-15 or MW-18 with the exception of toluene.

Monitoring well MW-25 results from Mann-Kendall analysis indicate that total xylenes are increasing slowly over time. Other gasoline related analytes from MW-25 are decreasing, indicating that the heavier chemical analytes (e.g. xylenes) are migrating past the well. This slight upward trend is seen in the GRO data. In contrast, benzene and toluene concentrations in GRO are decreasing.

The monitoring well network has been affected due to well damage since the 2013 sampling event with the loss of monitoring wells MW-25 and MW-35. Loss of monitoring well MW-35 appears to be of limited effect since MW-34 is still intact and MW-35 is located down to cross-gradient. Loss of MW-25 effects analysis of results as it has consistently remained above cleanup levels and is located near a low point in the fuel hydrant system used as a drain.

#### 5.2 **Recommendations**

R&M provides the following recommendations for the Site:

- Complete decommissioning of monitoring well MW-25 in accordance with ADEC Monitoring Well Guidance by removing the well casing or over drilling.
- Re-survey monitoring wells MW-1R, MW-30R, and MW-34 to re-establish elevations.
- Investigate the use of MW-5 and/or MW-2 as replacements for MW-25 in the monitoring network as part of 2019 annual sampling.
- Continue biannual sampling of the monitoring network in coordination with ADEC. Future sampling events should occur in the fall of odd numbered years until ADEC concludes that monitoring is no longer necessary.

### 6.0 CLOSURE

This report has been prepared for the exclusive use of DOT&PF FAI and their representatives in the study of this Site. The findings presented within this report are based on limited sampling and laboratory analyses conducted by R&M. Since opinions of conditions prevailing on a particular site must be based on the work authorized by the client, all findings/data must be construed as representative of the Site at a particular moment in time and the result of services performed within the scope, limitations, and cost of the work requested. Changes in the conditions of this Site may occur with the passage of time and may be due to natural processes or the works of man. In addition, changes in government codes, either State or Federal regulations or laws, may occur. Due to such changes, which are beyond our control, observations and recommendations applicable to this Site may need to be revised wholly or in part from time to time.

R&M performed this work in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions. No warranty, express or implied, beyond exercise of reasonable care and professional diligence, is made. Should you require additional information regarding the investigation or this report, please contact us.

Sincerely,

R&M CONSULTANTS, INC

### DRAFT

### DRAFT

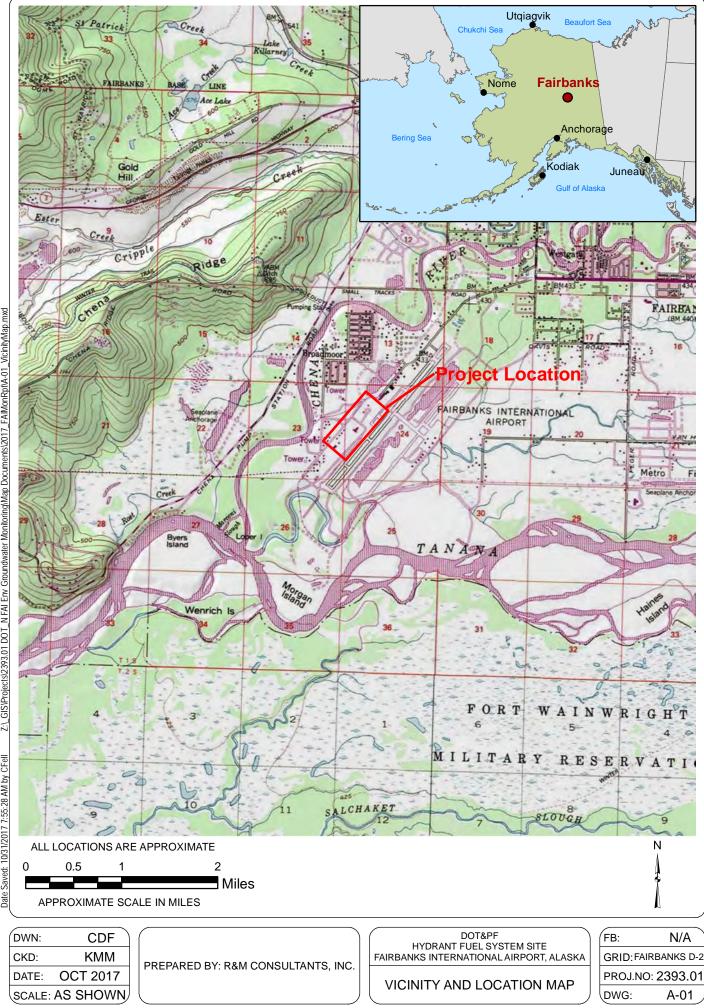
Christopher D. Fell, CPG Senior Geologist Kristi M. McLean, LEED AP BD+C Group Manager – Environmental Services

### 7.0 **REFERENCES**

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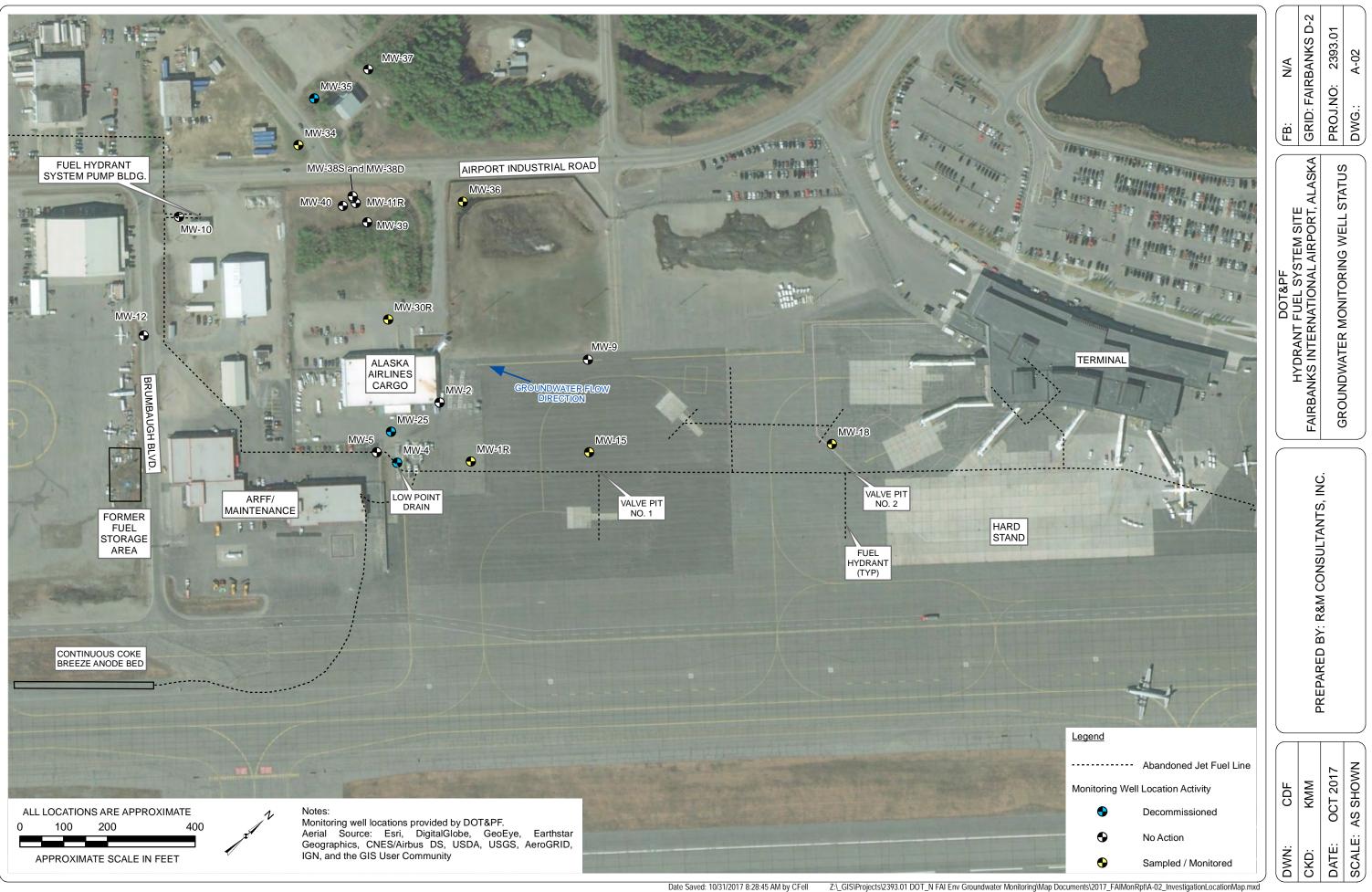
# APPENDIX A Drawing

Location and Vicinity Map	A-01
Groundwater Monitoring Well Status	

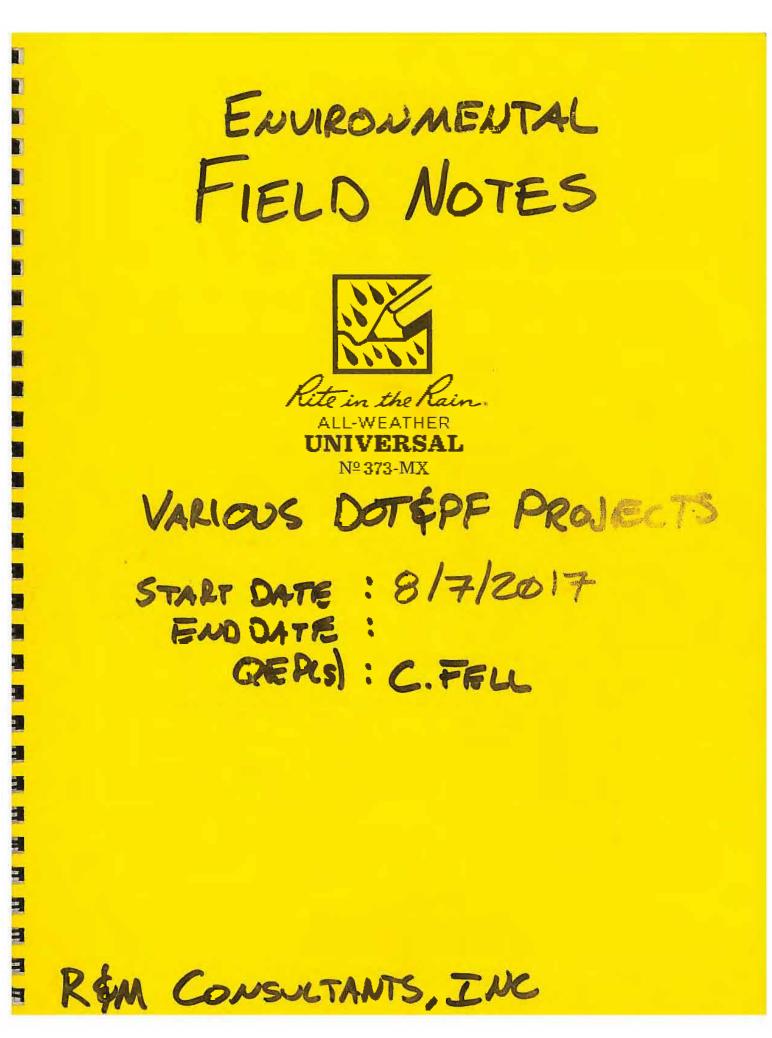


Z: GIS/Projects/2393.01 DOT\_N FAI Env Groundwater Monitoring/Map Documents/2017\_FAIMonRpt/A-01\_Vicinity/Map.mxd

Date Saved: 10/31/2017 7:55:28 AM by CFell



# APPENDIX B FIELD NOTES



9/5/2017 FAT GW MONITORING WXI SØSF, lightwind, averant 2393,61 G.Fell C.FELL 30405 ARINED AT FAI BADGING OFFICE FOR TRAINING STEVE BRUNANSKE W/ DOTEPF DROVE THE STOE W/ REM AND DISCUSSION SECURITY CONSIDERATIONS & SCHEDULE FOR SAMPLING WIELLS TO MINIMIZE ZARACTS TO FAIL OPERATIONS ATTEMPTING TO LOCATE WELLS # 34 & # 35. THEY APPEAR 1300 BURIED IN SOM & LANG GRASS 1325 OFFSITK TO GET A SCHONSTEPT AND MAGNETIC PLACARDS FOR THE VEHICLE. BACK ON SITE TO LOCATE WELLS # 34 \$#35. 1450 1557 LOCATED MW35, IT HAS BEEN BROKEN OFF AT APPROX 3FT BGS AND IS DRY, PLESUMED TO BE PARTIALLY FILLED WITH SOIL FRAM SLOVGHING. OPEN CASING WAS 3. 85FT DEEP 6,95 FH B6S, APROXIMATELY) MhJ-35 FIELD SKETCH BLDG 63.e UTILITY 70 POLE GRASS/GRAVEL 36.5Ft MW3S noto S. (DECOMMISSIONED) (DESTROYED) X SWING TIES FROM PREVIOUS ENVESTIGATIOUS. Rite in the Rain Scale: 1 square = \_\_\_\_ 1

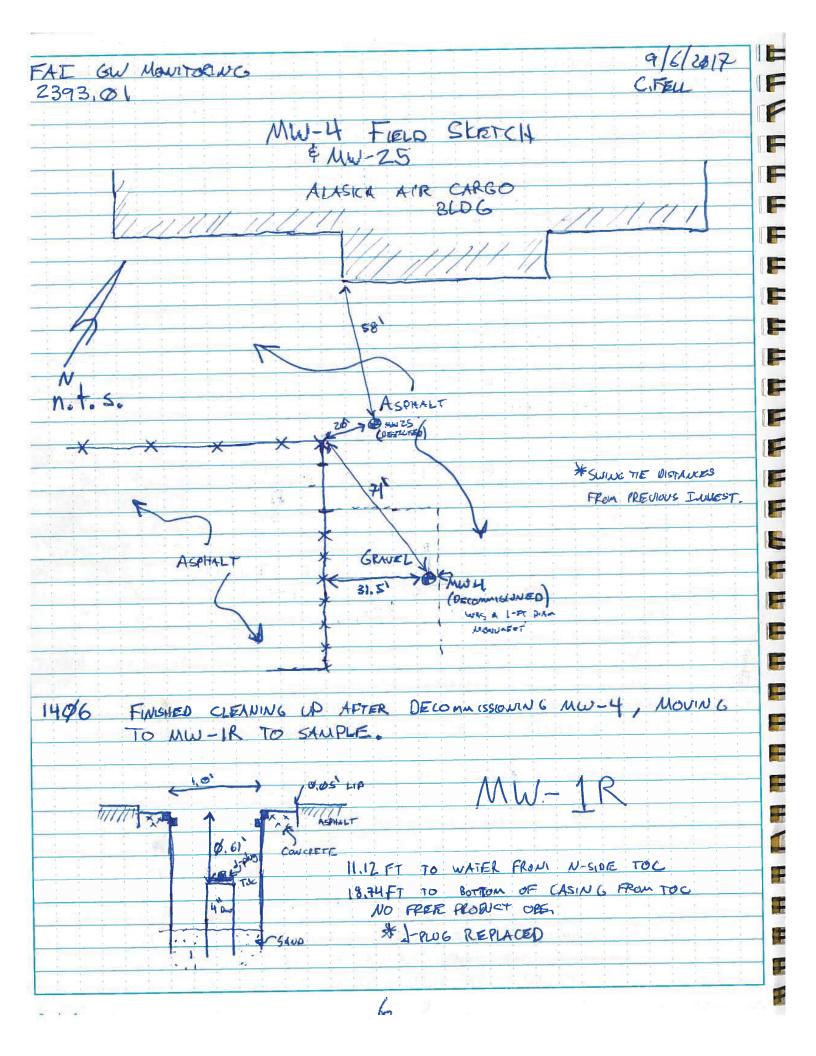
-9/5/2017 FAIL GW MONITORING C.FELL 2393.01 F FINISHED FILLING REMAINING CABILG AT MW35 (DAMAGED) LOCATION 1642 W/ MEDIUM DEDTOWITE CHUS AND SEALING HYDRATING WITH I-GAL OF AWATER -BACKFILLED FROM ONO 3 FT WITH SPORES GUENERATED LOCATING THE WELL 160 MOUNG TO LOKATE MW34 **E** -1652 LOCATED MW34 BULIED UNDER APPROX ZIN OF SOIL & GRASS -MW-34FIELD SKETCH AIRPORT INDUSTRIAL -ROAD + SIGN 300 OTILITY 0 POLE GENSS/ GENVEL MW 31 33 3" P RO 2 d, SS' AW 34 VIZNER BOLTS. 542 J-plus 35'6" Sou 5 Sau 1 G SEWER MANHOLE 6.54 FT TO GW BELW TOC 50 L 13.28 FT TO BOTTOM BELOW TOL NE SUTING TIE PISTALLES NO FREE PLODUCT OBS FLAM REVIEWS JUNEST, -655 -TAYING WATER LEVEL REAGING W ZWTER FACE PROBE Ĺ 6.54 AT TO WATER, NO FREE PEDDUCT DETECTED F NO PETROLEUM OPDE OBS. ON PROBE AFTER REMOVAL All stor al short WELL IS W OK CONDITION. ONE 1/2 WELL DOLT MISSING 1715 C.FELL OFFSITE FOR THE DAY F Scale: 1 square =

FAT GW MONITORING WX: OFRIAST SOSF 9/6/2017 2393.01 CIFEIL LIGHT WILLO 0650 TASK LIST · MEASURE DEPTH TO CASING IN MW-34 · LOCATE AND GAUGE MW-36 · LOCATE MW-30R э · ABANDON MW-4 \* · SAMPLE MW-25 -> DESTROYED " SAMPLE MW-15 · SAMPLE MW-IR REPLACE J-PLUG V · SAMPLE MW-30R / REPAIR MW-30R MONUMENT / · SAMPLE MW-18 \$722 CIFELL ARRIVED ON SITE MEASURED DEPTH TO WELL OSING IN MW-34 FLUSH-MOONT 0732 40.42 FT. ONE BOLT SECURIUG LID MOVING TO MW-36, LOCATED INSIDE THE ADA FENCE 10747 BADGE WONT ABORTS GATE IS CHECKED COUDITION OF MW-30R MONUMENT MISSING GLAP IN PLACE 0758 C. FELL OFFSITE TO GET COUCLETE TO PEPAIR WELL & REPLACE SURFACE COMPLETION (FLIGH-MOUNT) \$840 MET WITH DOT 4F BADOW 6 OFFICE TO SOLT OUT GATE ACESS SPOKE WITH ALASKA AIRGERE TO LET THEM KNEW I LIDUED BE WORKING IN MARINE LOT. 0850 SETTING UP ON MW-30R WELL IS EXTREMELY SLOW. TO RECHARGE 3 Rite in the Rain .

9/6/17 FAE GW MONTORING F CiFau 7393,01 P (SAMPLOD) #SAMPLE # TRIP BLANK 0800 FATIZ-QU-TBOI 9/6/17 CIFELL AKION > 3 40ml VOA w/HCI prepared by SGS GRO SWEDRI BTEX PLACED IN A PRECHURO CONFR 900 0917 BEGAN FURGING MW-70R 1002 FINISHED PURGING MW-30R, LUT OFF END OF TUBING ENTERING YST FLOW CEN 1004 X SAMPLEX PRIMARY FAIT MW30R 3. 9/6/17 CFEU > 3 40ml UDA W/ HCH ALLOI 6-80 100 SWEDRI BTEX 2 250 M ANBER GLASS W/ HCI AKIÓZ DOD IMMEDIATELY PLACED IN PRECHILLED COURS FORMANDE COLLECTION 110 BEGIN REPAIRS TO MW-30R SURFACE COMPLETION 1030 **JE** REMOVED COLD PATCH APPHALT (2 inclus) AND DEA GRAVEL REMAND DAMAGED MONSMENT. CUT OFF \$.40 FT OF CASING. 160 . NEW GURFARE COMPLETION 16 Ta-ALPHALT (~ ZN) 210-1 10 - 30min QUIKCHETE ~ 3m DU2 - PEA GRAVEL MW-30R 10 SOL 10 SOIL ð -8.74 FT TO GW BELOW TOL 17.53 FT TO BOTTOM BELOW TOC ų, NO FREE PRODUCT OBS, П Ц

FAS GW MONITORING C.FELL 2393.01 FINGHED SETTING NEW SURFACE COMPLETION AND CLEANING 133 UP. WAITING 30 MIN FOR CONCRETE TO SET AS THIS WELL IS LOCATED IN A MIGH TRAFFIC AREA. WELL MEEDS TO BE RE-SURVEYED. IELD SKETCH MW-30R ABANDONED (6. CF+) 85 ASPHALT HATCE N n.t.s. HEAD BOLT will GRANEL PAD 2 # SLANG THE DISTANCES FROM PREVIOUS INVESTIGATIONS 41 71 AL AIR CARGO 49 LEAVING MW30R - GOING TO ABANDON MW-4 ON THE ARFIELD 212 MU)-4 IS & G-INCH DIAMETER CASING POURED 2 BAGS OF BENJONITE HOLE PLUG INTO CHING EACH FILLS APPROX 3.5 FERT OF CASPAGE BASED ON MANUFARTURERS CHART. STILL 10.8 FEET OF OPEN CASING LA AETO 3 MORE DAGS. 1220 C.FELL OPFSITE TO GET MORE BENTON ITE 1318 GFELL BACK ON SITE, ENTERING THE ADD THEN GATE IS, BEGAN DECOMMISSIONING MW-4 In FILLED TO 2FT 365 WITH 3/8 BENTONITE CHIPS (45 bass In EXCAUATED TO ZET BGS WITH SHOWED, REMOVED FLUSH MOUNT AND LUT OFF WELL CASING AT APPROX ZET BGS. LA BACKFILLED WITH SPOILS FROM AROUND WELL Rite in the Rain .

Scale: 1 square = \_\_\_\_



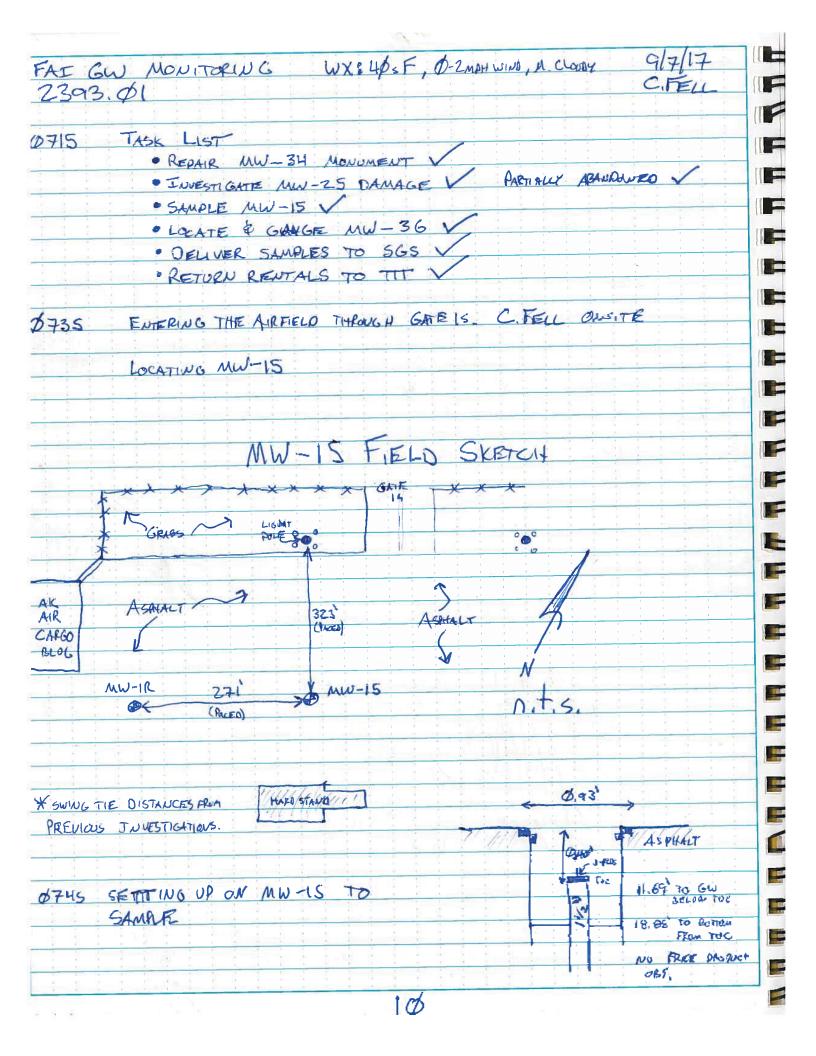
FAT GW MONTORING 2393,01 C.Fel 442 START PURGING MW-IR STOP/END PURGING MW-IR, CUT OFF END OF THEMA ENTERING YET FLOW CELL 1512 SAMPLE 1513 (PRIMARY) FAT 17-MW1R (DUPLICATE) 1515 FAI 17-MW8R 9/6/2017 C. FELL GRO (ALION) 6 40mL VOR w/ HCI BTEX (SW 80521 - 4 250 ML AMBER GLASS W/HCI (AKIOZ) DRO IMMED ATELY PLACED IN ARE CHUED COOLER AFTER COLLECTION CD 1527 CLEANING UP AT MW-IR. DECON JATOER JACE PROBLE CREEN - SIMPLE GREEN WASH - Z RINSTE U/ DISTILLED HO MW-IR FIELD SKETCH ALASKA AIR CARGO, BLDG T. 154 3 ASPHALT × - × - ×-175.5 ASPNALT 6 Robco FLUSIL -MUUNT X CRAVE FENCE 0 2.5 APART MW-12 CENTER TO LEDTOR (1FT DIAM Matanada JET BLAST GUARD \* SWING THE DISTANCES FLOW PREVIOUS ENUDSTIGATIONS WISDE 1540 FINISHER AT MW-IR, MOUINE TO MW18 NEAR TERMINAL,

Rite in the Rein .

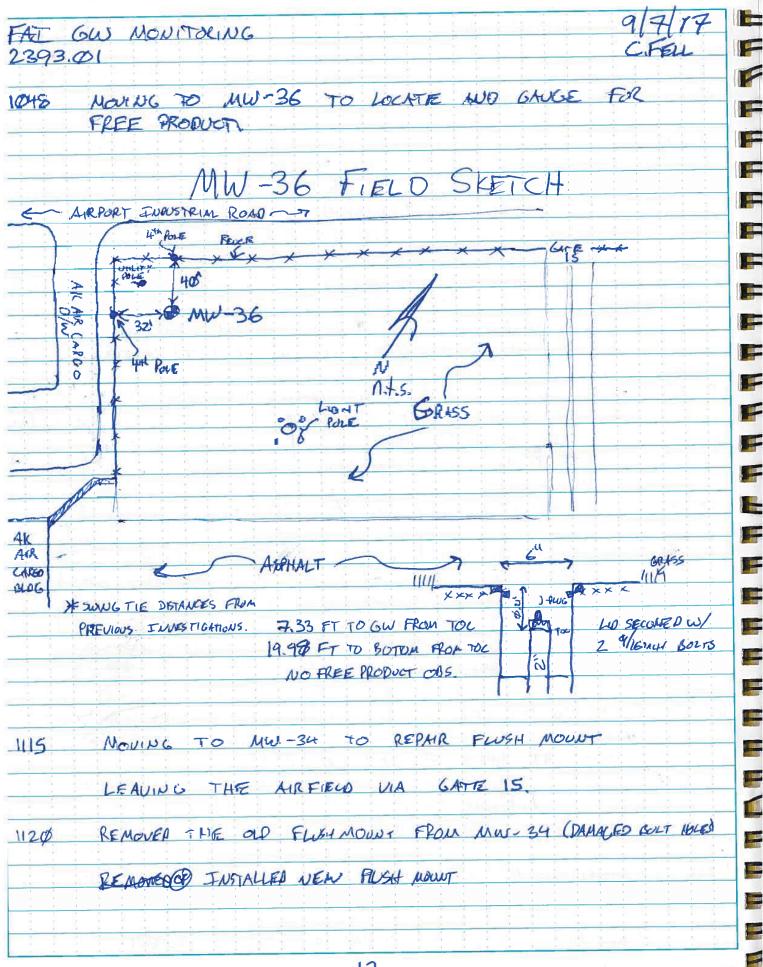
7

9/6/17 FAT GW MONTORING 2393.01 F C.FELL P 1545 SETTING UP AT MW-18 TO SAMPLE -MW-18 SKETCH 0 FIELD LIGHT PULF JETWAY FAT -TERMINAL 323 BLOG JETWAY N 70 ULER MOST COLUMN notes. 295 F ASPHALT-KSWING TE DISTANCES FROM PREVICES F INEST GATIONS 1-18 €-0.55-> F 170 1111 0.39 ASPHALT John MORPISON 11,36 FT TO GW FROM TOC (N.S. DE) F FLISCH MOUNT TOC (12" BOLTS) 18.90 FT TO BOTTOM CASING FROM TOC 4 Sz OBI AD FREE PRODUCT OBS CP FUEL ODOR, SHEEN 1610 START PURGING MW-18 -7 0.01 FREE PRODUCT OBS 1720 PURGING MW-18 -> SAMPLE END CUT OFF END OF TUBLUG ENTERING HER FLOW LEW \* SAMPLE \* 1721 FAILT-MWIS (PRIMARY) ø 9/6/17 C.FELL GRD. (AK:0) > 3 40 ML VOA W/HCI (Sil 8021) BIEX -> 2 250 ML AMBER SLASS W/ HCI (AK102) DRO 12 I HAVE ON A PRECHILLED LOOISE FOLLOW WIG COLLECTION 8

FAI GW MONITORING 9/6/17 2393.01 CIFELL CLEANING UP AT MW-18, FOD CHECK BEFORE LEADING 1730 DECON WATER LEVEL INDICATOR (INTER FREE PROBE) LOSIMPLE GREEN WASIT Ly 2 DISTILLED HOD RINSES, 1745 GOING TO LOCATE MW-25 NEAR ALASKA AIR CARGO USEE PAGE & FOR LOCATION X LO MW-25 HAS BEEN DESTROYED, LIKELY NEEDS A DRILL RIG TO BE PROPERTY. DECOMMISSIONED, 1755 LEAVING THE AIRFIELD 1810 C. FELL OFFSITE FOR THE DAY the glotapit 9 Rite in the Rain . Scale: 1 square = \_\_\_\_



FAT GW MONTORING 2393.01 0843 START PURGWG MW-15 \$926 FINISHED PURGING MW-15, CUT OFF END OF TUBING ENTRING 4SE FLOW (BLL 0921 \* SAMPLE \* FAILT-MWIS (PRWARY) 9/7/17 C.FELL BIEX (SW8021) > 3 40 ML VOA W/ HCI GLO DRO (AKIOSZ) -> 2 250ML AMBER GLASS W/HCL IMMEDIATELY PLACED IN A PLE CHILLED COOLER AFTER GUECTION \$930 CLEWING UP AT MW-15 AFTER SAMPLING DECONTAMINATED INTERFACE PLOSE L'SIMPLIE GREEN WASH 4 2 DETILLED HOO RINGES 10937 MOVING TO INVESTIGATE MW-25 DAMAGE. \$940 MW-25 IS BLOCKED W/ RED PLASTIC HOLLOW ROD & SOIL. FLUSH MOUNT LID & J-FLUG ARE MISSING, WELL COUSISTED OF A 12- WOH DIAMETER SCH SO STEEL PIPE. THE PIPE HAD JACKED ABOVE THE PAVENENT SURFACE AND LATTER BEEN DAMAGED BY SURFACE TRAFFIC. THE METAL PHAE WAS PARTIALLY COLLAPSED AND BAENT. EXCAUNTED THE FLUSH MOUNT SKIRT. WHICH HAD 1015. BEEN SET IN THE ASPHALT 1940 W/ ~11/2-ndes of CONCEPTE LOUT OFF APPEOR GINCHES OF PIPE. INSTILL BLOCKED AT I. UFFET BELOW NEW LUT OFF. ~ 2.9-FEET B(SS. INFILLED W/ BENTONITE 1047 FINISHED PLACENS A NOTEN 12-INCH THICK CONCRETE CAP OVER THE WELL LOCATION (MW-23) 2 RECOMMEND OWER DRILLING TO REMOVE THE WELL PROPERLY. Rite in the Rein .



12

FAI GUS MONTORING 2393.01 C.FEL 1144 PREPARING CHAW OF CUSTODY FOR SAMPLES SAMPLE SUMMARY @ FAI 17 - RC-TBOI (TRIP BLANK) @FAILT-MWIR (ARIMART) · FAILT - MW8R (DUPLICATE OF MWIR) (PRIMARY) · FATIT- MW15 · FATIZ - MWIS (PRIMRY) 31 1 PRIMARY · FAIT - MW30R 220 DUNDED APPRION 100 GALLENS OF AUGGE/DECON WATER IN THE DOTER OIL WATER SEPARATAR - C. FELL OFFSITE RETURNED RENTALS TO TIT ENVIRONMENTAL 1315 1325 DROPPING SAMPLES OFF AT SGS IN FAIRBONKS 24ALSTOPHER JAIL ž Rite in the Rain . 13 Scale: 1 square = \_\_\_

# APPENDIX C SAMPLING FORMS

MW-1R

9/6	tiz	GRO	DUNDW	VATER S	AMPLI	NG/PUR	CING C	ATA	2.13	1	
				S	ite Informat	ion	_			1	
Project No.	Z39:	3,01	Project Name: F	AT GW	Manitak	UNG	Sheet	of	F	1	
ADEC QEP:	C.F.		Purge Date: 9	617	Sampling Date: c	7/6/17	Well ID: Mh	1-1R			
Weather:			5-19mah win	D GOLF	Site Notes: No	FREE PROI		RUED		1	
			S MAPS MIN	Well D	ata and Calc	ulations					
Depth to GV	V (ft btoc):	11.12				tions (Casing /Be				]	
TOC Stickup	(ft): - 0	0.61	Casir Borebo	ig Purge = Depti	n casing – depth	GW or top filter GW or top filter	pack[submerge	d well] * gal/ft(	casing)	1.11	
Well TOC Ele		7	DEFAULT PURC	E (3 Volumes)	reasing acpen	off of top filter	pack[submerge	a menji qanjiriti	bolichole)		
Well Casing	Depth (ft b		Casing Purge	(	ft	<u>ft)</u>	gal/ft *3 =	gal *3.79 L/	gal =L		
Well Casing Depth (ft btoc)       18.744         Well Condition:       Reseable Parge         MAX PURCE (10 Volumes)       10											
PIUDICAPITE,											
1 Bott STRIPPSD, Casing Purge = (18,74 ft - 11,12 ft) . 0.653 gal/ft '10 = 49.8 gal '3.79 L/gal = 188.6 L COMPRESSIVE CAP											
DAMAGED Bezehole Purge = ( R) gal/ft 10 = gal/ft 10 =L										-	
Purge and Sampling Data           Start Color:         Sampling Depth (ft btoc):         7         Tubing Length (ft):         Equipment Used:         PERESTALTIC PURP											
K LAN DE YELLAU											
Odor Purge End Time: 1515 Breathing Zone ALA JUTERTACE PROBLE											
VOID NONE OBS A START											
Water Quality Parameter Data Parameter Measurements											
	Voli (Gallons	ume or iters	± 3%	± 0.1	± 3%	± 10 mV	± 10%	± 10%	Drawdown	1	
Time	(Galiolis		(Min ± 0.2 °C)			L	DO		< 0.3 ft Water Level		
	Change	Total	Temperature (°C)	pH (std units)	Conductivity (05/cm)	ORP (mV)	(mg/L)	Turbidity (NTU)	(feet btoc)		
1442	Ø	Ø		<u></u>					11.12	0.25L/m	
1447	1.25	1.25	9.90	6.37	642	122.3	1.61		+11.15	/ m	
1452	1.25	2,50	-9.47	*6.46	- 612	- 96.3	- \$.98		+11,15		
1457	1.25		*9.45		* 611	\$ 92.8			1	1.5	
		3.75		*6.49		and the second second			*11,15	1, 2, 2,	
1502		5.000	*9.26	*6.51		* 86.0	* 0.89				
	1.25		*9.21	*6.53	* 608	* 82.2	* \$,87	/	\$11.16		
1512	1.25	7.S¢	\$ 9.13	\$6.55	* 609	¥76.8	¥ Ø.82		*11.16		
			· · · · ·				· .				
			Sit	AMPLE	t C	151.	Б.				
				•							
			٠				•			1	
						1					
									-		
										-	
Notes					Commis Collection	) (Sample ID, Analys	Les No Contrin	Dracan in this - t -		1.1	
Notes: LØ	1/2B	MORRIS OLTS	w Mavon	1513	FAI17 FAI17	- MW R - MW R	(ARIMARY) (DUPLICATE		(7-		
	4".00	4m (m	EU		AKIGI (	(RO) 3 6 40	me vol w/	401		1.6	
N	o fre	if prov	Dier OBS		AK102 (	OR01-47	SØML AMBE	CLASS WI	/ Hel		
onstants	: Casing D	nameter (i	n) / Gallons per	Linear Foot: 1.2	5/0.041 2/0.	163 4/0.653	6/1.47 8/2	.61			

Parameter stability: 4 consecutive readings for 3 parameters (4 if using temperature ) are within ranges indicated above.

### MW-15

9/7	17	GRO	DUNDW		AMPLIN		GING D	ATA	
Project No.		4	Project Name:	-	ite Informati			_	
Project No.	239?	5.01	F	AL GO	N MON	TORING	Sheet:		f
ADEC QEP:	C.FE	ELL	Purge Date: 9	7/17	Sampling Date:	71717	Well ID: M	w-15	
Veather: 4	05-50	F. 0-	2 MAT WIND,		Site Notes: NO		DUCT OBS	FRUED	
					ata and Calc				
·	V (ft btoc):	11.69			11 Purge Calculat				
OC Stickup	<u> </u>	5.40	Borehol	e Purge = Deptr e Purge = Depth	casing – depth casing – depth	GW or top filter GW or top filter	pack[submerge	d well] * qal/ft(l d well] * qal/ft(l	casing) borehole)
	evation (ft):	?	<b>DEFAULT PURG</b>	E (3 Volumes)					
ell Casing	Depth (ft bi	(8.88	Casing Purge		+	n)	gal/ft '3 =	gal *3.79 t/	<u></u>
ell Condit			MAX PURGE (10	Volumes	t	<del>ft)</del> *	gal/ft "3	gal *3.79 L/	gal =t
Bolt		-	Casing Purge =		11.69	ft) · 0.092	$a_{\rm a}/ft^{10} = 6$	aal *3.79 L/c	gal = 25.1 L
	MODERA	-	Borchole Purge =1		_		ral/ft 10 =	qal *3.79 L/a	No.1
	2 COLORN	1-	borenoie runge		and Samplin			941 2112 49	
art Color:	CLEA	LR.	Sampling Depth (	ft btoc): 13	Tubing Length (ft)	16	Equipment Used:	I UTERFACE	DROBE
d Color:	CLE		Purge Start Time:	0843	PID Readi Ambient:	ngs (ppm)	TEP LINED	TURIANCY	")
dor:	NON		Purge End Time:		Breathing Zone: Well:	N/A	SILICON TU SSGMPS	BING (Egn	)
		- 2		Water O	uality Param	eter Data	330773	70	
	Vol	ume				meter Measurer	nents		
Time		orLiters	± 3%	± 0.1	± 3%	± 10 mV	±10%	± 10%	Drawdown < 0.3 ft
Time			(Min ± 0.2 °C) Temperature	рН	Conductivity	ORP	DO	Turbidity	Water Level
_	Change	Total	(°C)	(std units)	(MS/cm)	(mV)	(mg/L)	(NTU)	(feet btoc)
8843	Ø	ø	_					-	11.69
\$848	1.25	1.25	7.78	6.37	476	79.3	3.20		*11.82
\$853	1,25	2.50	7.32	\$6,45	* 483	- 66.5	- 1.86	/	*11.83
8858	1.25		\$7.22	\$ 6.55	*480	- 53.3	- 1.38		×11.83
6803	1.25	5.00	*7.22	* 6.63	* 476	- 33.2	* 1.32		¥11.82
				* 6.67		* 23.6	* 1.17		* 11.82
908	1.25	6.25		0107					
0913	1.25	7.50	+ 7.18	Give	100	- 7.1	1		\$ 11.82
1920	1.25	8.75	# 7.27	* 6.73	* 461	- 10.5	* Ø.94	-	* 11.92
				6					
				1.	0,0		da		
				SAM	PLZ	@ q	P92	11	
									1
otes:	O FRE	E PROD	UCT OBS.				ses, No. Containers		
10	<b>U</b>				PAL 17	- MWIS		9/7	417
					GRO (1	HK101) 73	40lme vor w	Ha K	971
0.93	Dina 1	FULUSU .	MOUN T . NG	BOLTS					
1	1/2" DIA	M WEI	MOUNT, NO		URO (A	K102 -77	2 250mm	AMDRER GLASS	wit not a
netante	Caring	iameter (i	n) / Callons per	Linear Foot, 1 2	5/0.041 2/0.	163 4/0653	6/1/7 8/2	61	

**Constants:** Casing Diameter (in) / Gallons per Linear FOOT: 1.25 / 0.041 2 / 0.103 4 / 0.053 0 / 1.47 0 / 2.01 **Parameter stability:** 4 consecutive readings for 3 parameters (4 if using temperature ) are within ranges indicated above.  $1\frac{1}{2}$  = 0.002 GA2/FFT

2SL/AW



MW-18

9/6/17 GROUNDWATER SAMPLING/PURGING DATA											
						nformati					
Project No	2393	61	Project Name:	AT GW	AX	DUITOR	ING	Sheet	: of		
ADEC QEP:	C.F.		Purge Date: 🥱	1		pling Date: 0		Well ID: Mu	1-18		1
Weather:	L. CIOUD	y 10-19	MPH Gto Ze	60sF	Site	Notes:	PT FREE	OPDOUCT C			1
			Store Istact	Well D	ata	and Calc	ulations	PPC GD - 1	1 Accord		
Depth to GV	N (ft btoc):	37 Gw					tions (Casing /B				1
TOC Stickup	o (ft): 🗕 💋	5,39	Casir Boreho	iq Purge = Depth le Purge = Depth	i casi i casi	ing – depth na – depth	GW or top filter GW or top filter	pack[submerge	d well] * qal/ft( d well] * qal/ft()	casing) porehole)	
TOC Stickup (ft):											
Well Casing	Depth (ft b	toc)	Casing Purge =	·[1	t		ft)	gai/it '3 =	gal * <del>3.79 L</del> /	igalL	
Well Condition:											
$\frac{MAX PURGE (10 Volumes)}{\int PLUG} = (18,90) \text{ ft} - 11.36 \text{ ft} \cdot 0.092 \text{ gal/ft} \cdot 10 = 6.94 \text{ gal} \cdot 3.79 \text{ L/gal} = 26.3 \text{ L}$											
J = pLOG Cashig Funge = ( ft = ft =ft =ft =ft =ft =ft =ft =ft =fft =											
Purge and Sampling Data											
Start Color: V.	LIGHT Y	ELLOV	Sampling Depth (	ft btoc): 13	Tubi	ng Length (ft	10	Equipment Used:	INTER FOLCH	e Probe	
End Color:	CLEA!		Purge Start Time:	1610		PID Readi Ambient:	ngs (ppm)	SSG MAG VE	E III		
Odor: SLI	GHT FU	HEL ODUR	Purge End Time:	17200		reathing Zone: Well:	1.1.1	SILICON TUBI	NG 26		
				Water Q	ual		eter Data				1
	Volt	ume	± 3%			Para	meter Measurer	nents		Drawdown	4
Time	(Gallons	or L(ters)	(Min ± 0.2 °C)	± 0.1		± 3%	± 10 mV	± 10%	± 10%	< 0.3 ft	
	Change	Total	Temperature	pH		nductivity	ORP	DO	Turbidity	Water Level	1
10106		Ø	(°C)	(std units)		toS/cm)	(mV)	(mg/L)	(NTU)	(feet btoc)	ď.
1610	Ø,S		Fox of A	(.)	-		43.4			11.36	Ø.
	-	ØS	10.08	6.19		20		3,39		-12.69	-
1620	Ø.S	1.0	- 9.26	+6.35	+	98	* 48.2	- 2,78		+12.64	-
1625	Ø.S	1.5	- 8.98	+ 6.63	4	206	*35.6	- 1.47		+12.58	1
1630	Ø.S	2.0	+9,36	# 6.68	*	217	-20.1	+ 1.75	-	+12.56	
1635	Ø.5	2.5	+9,79	*6.72	+	268	*11.6	-1.40		+12.54	
1640	0.5	3.0	\$9.51	*6.76	+	305	\$ 8.2	- 1.11		12.54	*
1645	0.5	3.5	\$9.45	+6.78	+	345	*-211	\$ 0.91		12.54	4
1650	0.5	4.0	*9.43	* 6.80	+		*-11.9	* 0.78			*
1655	Ø.5	4.5	*9.34	* 6.83	+	388	28.9	* 0.73		12.54	×
	ØS	5.0		*6.83	+		39.8	# 0.65		12.54	
	Ø.S		\$ 9.48	₩ 6.86	4			* 0.51		12,54	*
1710	t		* 9,51	7 6.86	¥		* -49.5	17 Thursday of the second second		12.54	*
1715	6.5		* 9,43	* 6.86		438	A.4	0.12		12.54	×
1720	Ø.S	7.Ø	\$9.62	* 6.87	⊁	447	* -56.0	0.90		12.54	≭
			C	MPLE		$\mathbf{a}$	1721				
Notes:	ØIPT O	F FREE	PRODUCT BA	s D			(Sample ID, Analys		, Preservatives, etc	aleliz	
	TUE WI						- WMIS			C,FELL	
						520 (1	tkiøi) >3	3 4 Ome UDA	w/Her		
BULL	SHEEN LA MERA	(PETROLI	EUM) ON W.	AT ER		DRO (A	kloz) - Z	- 250m1 +	ANOTE GL	HSS w/HEC	
11/11	BIAM I	NEW	sit notive w	ic c pouro					2		

Constants: Casing Diameter (in) / Gallons per Linear Foot: 1.25 / 0.041 2 / 0.163 4 / 0.653 6 / 1.47 8 / 2.61 Parameter stability: 4 consecutive readings for 3 parameters (4 if using temperature ) are within ranges indicated above.

12 = Q. Ø92 UN/LF

LAw

-

MW-25

9/7	17	GRO	OUNDW				RGING D	DATA	
Project No.			Project Name	5	ite Informati	on			
Project No.	2393	Ø1		AZ GI	w Mour	ORING.	Sheet		
ADEC QEF:	CIFF	zch	Purge Date:		Sampling Date:			N-25	
Weather:	HOSF.	0-2M	At		Site Notes WE	LL DES	TROYED /	HOCKE	0
Depth to G	W (ft btoc):		-	and the second	ata and Calc		(D 1 - /D	ture 1	
NOT /	W (ft btoc):	20	Casin	a Purae = Depti	n casing – depth	GW or ten filt	Borehole/Parame	tersi d welll * gal/ft/g	asino)
	levation (ft):	<u>2</u>	Borehol	e Purge = Dept	casing - depth	GW or top filt	er pack[submerge er pack[submerge	d well] * qal/ft(b	orehole)
	g Depth (ft b	1	Casing Purge =			ft) •	gal/ft *3 =		
Well Condi			Borehole Purge =	(	t.	SHI	gal/ft *3 =		
	TROYE	ŝ	MAX PURGE (10	Volumes)		37410			
	ANDONT		Casing Purge 🚥	ff	t	ft) *	gal/ft 10	gal *3.791	al=L
6/70.			Borehole Purge = (			t) •	gal/ft *10 =	gal *3.79 L/g	al =L
Start Color:			Sampling Depth (1		and Samplin		Equipment Used:		
End Color:		<u> </u>	Purge Start Time:		PID Readin	NA		. 1	
Odor:	+++	14	Purge End Time:	<u>-////</u>	Ambient: Breathing Zone:	NA	N	IA	
	• •		ruige chu rime:	JA/ohon C	Well;				
	1		T	water Ç	uality Param Parat	<b>eter Data</b> neter Measur	rements		
		ume or Liters)	± 3%	± 0.1	± 3%	± 10 mV	±10%	± 10%	Drawdown
Time	(Galions	1	(Min ± 0.2 °C)						< 0.3 ft
	Change	Total	Temperature (°C)	pH (std units)	Conductivity (mS/cm)	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Water Level (feet btoc)
	1		( 2/	(204 - 2002)	(	()	(		(
									h
				/	r				
			/	<u> </u>	/				
							1		
	<b> </b>			$ \land \land$	· · · · · ·	/	-44		
						X	EU A		
						$\langle \mathcal{Y}_{\mathcal{Y}} \rangle$	//		
			$\chi$ ///		offer	1	hit		
			$\sqrt{///}$		DAN		OU		
				.015	Or	110			
				ALLO		11			
	1				- U	J	_		
		M				•			· · · · · · · · · · · · · · · · · · ·
		FII							
- A		x V							
it	T -						-		
Notes:					Sample Collection	Sample ID Ana	lyses, No. Containers,	Precervatives etc	).
a ME	TAL F	TPE J	AMMED _	Top	painple collection.	рапиріє ір, мпа	ayses, no containers,	FICSCIVALIVES, ELC.	)÷
. PLA	stic	ROD :	SNAPE O OF						
ME	MERAL PIPE								
" CUT	4.5 P	TOF	PIPE, PERMI	NEW			105		
Constant	5: Casing D	jameter (i	in) / Gallons per	Linear Foot: 1.2	5/0.041 2/01	63 4/0.653	6/1.47 8/2	.61	
Domosoaha	n sk-Lilik.				1				

3 parameters (4 if using temperature ) are within ranges indicated above. 12 = 0.092 GAL/LF



MW-3OR

96	;117	GRO	DUNDV				rging d	DATA		]
				S	ite Informat	ion				1
roject No.	2393	.0(	Project Name: 🌮	AZ GW	Mouror		Sheet	of	F	
ADEC QEP:	C.FE	L	Purge Date: 9	6/17-	Sampling Date: 🥻	9/6/17	Well ID: ML	J-30R	•	]
Veather:	M. CL	0004	505-605F	LIDIT WIND	Site Notes: WS	il is sh	OW TO RE	CHARGE	NO FREE PIL	her.
				Well D	ata and Calc	ulations		/	COBSERVED	
Pepth to GV	V (ft btoc):	8.74					orehole/Parame			
OC Stickup		3	Casir Boreho	ig Purge = Depth le Purge = Depth	n casing — depth a casing — depth	GW or top filter	r pack[submerqe pack[submerqe	d well] * qal/ft( d well] * qal/ft()	casing)	
Vell TOC El	vation (ft):	?	DEFAULT PURC	E (3 Volumes)	aupen		partitutide		jorenoie,	
ell Casing	Depth (ft b	toc) 1357	Casing Purge	(	R	ft).	gai/ft 3 =	gal *3.79 L/	gal =L	
/ell Condit			Borehole Purg		At -	ft)*	gal/ft *3 =	gal *3.79 L/	gal=L	
FLUSH MOUNT MISSING Casing Purge = (17.53 ft- 8.74 ft) . 0.092 gal/ft "10= 8.09 gal "3.79 L/gal = 30.6 L										
Bershole Purge - (ftft)gal/tt '10gal-'2.791/galt-										
Start Color:   Sampling Depth (ft btoc): 10 Tubing Length (ft): 12 Equipment Used: INTERACE PROBE										
nd Color:			Purge Start Time:			ings (ppm)	PERISTALTI	CPUMP		
dor:	SAM		Purge End Time:	0917	Ambient Breathing Zone			D 14" TUBW	6 SSG MOS	
	Nor	UR_		1002 Water C	Well	1-1-1	SILION 31	"TUAWG		
Water Quality Parameter Data Parameter Measurements										
Volume $\pm 3\%$ $\pm 0.1$ $\pm 3\%$ $\pm 10$ mV $\pm 10\%$ $\pm 10\%$ Drawdown										
Time	(ounons		(Min ± 0.2 °C)						< 0.3 ft	
	Change	Total	Temperature (°C)	pH (std units)	Conductivity ( <b>b</b> S/cm)	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Water Level (feet btoc)	· •
8917	Ø	đ				,,	(	(	8.74	1
\$932	1.5	1.5	6.67	6.31	684	108.4	2.72		-11.00	0.14
0937			¥ 6.49		* 697	62.4	- 1.91		71.01	
6942	$\phi.5$			6.74	736		+ 4,42		-11.22	•
		2.5	8.47			15,6				0
6947	¢.5	3.0	8.00	\$ 6.77	*736		*4.70		-11.39	*
5952	Ø.S	3,5	*8,10	+6.72	+721	+1.0	- 2,92		-11.40	¥
6957	ØS	4.0	-6.80	*6.79	*717	\$-9.1	+ 3,40		-11.69	×
002	¢.S	4.5	- 6.38	\$6.64	*696	*-18.1	-2.00	~	-11.59	*
007	F				1					
			SAMP	EQ	1000	f				
					, , , , , , , , , , , , , , , , , , , ,					1
										1
									<u> </u>	
			DUMP SET		Sample Collection	(Sample ID, Analy	ses, No. Containers,		.): ,	
A			STILL FAL	UNG	indit-	TW SOR		004	at a c	
	GW LA	EVEL. E PLODU	TOBS		AKIOI	ORX	3 401	ni Ushw/	ILCI III AND	
\$.55	MOBELSON	PLUSH	HOUNT W/2	1/2" BOLTS	SWEDE	ATTEX	3 40/ Z 250,	nl ander g	lass w/Afer	
- (9	2 PIAM	WELL					6/1.47 8/2			

Parameter stability: 4 consecutive readings for 3 parameters (4 if using temperature ) are within ranges indicated above. 1.5/0.092

MW -34

9	SIT	-GR(	DUNDW	ATER S	AMPLIN	NG/PUR	GING D	ATA	
		56		S	ite Informati	on			
Project No.	2393.	ØI	Project Name:	HE GW		acus	Sheet:	of	
ADEC QEP:	C.FE	CL	Purge Date:	N/A	Sampling Date:	9/5/17	Well ID: ML	1-34	
Weather:	OSF,L	GHT W	TWO OVER	east	Site Notes:	9 FREE A	popul c	085-	
				went	ata and Calc	ulations			
Depth to G		6,54		We	Il Purge Calculat	tions (Casing /B	orehole/Paramet	ters)	
TOC Stickup	5	0.42	Casin Borehol	q Purge = Deptr e Purge = Deptr	casing - depth casing - depth	GW or top filter GW or top filter	pack[submerge pack[submerge	d well] * qal/ft(ca d well] * qal/ft(ba	asing) prehole)
Well TOC El	evation (ft):	?							5
Well Casing	Depth (ft b	toc)						gal *3.79 L/g	
Well Condit			Borehole Parge = MAX PURGE (10		t·	_ft) •	gal/ft *3 =	gal *3.79 L/g	alsL
-	t nour	NEEDS	Casing Purge =	f	t	ft) -	gal/ft *10 =	gal *3.79 L/ga	al=L
	R / REPL		Borehole Purge = (	ft		t)*	al/ft *10 =	gal *3.79 L/ga	l =L
Charles 3				Purge	and Samplin	ng Data		a seale f	1
Start Color:	NI.	4	Sampling Depth (f		Tubing Length (ft)	NA	Equipment Used:	FACE PRO	07
End Color:	NI	A	Purge Start Time:	NA	Ambient:	ngs (ppm)			
Odor:	NI	A	Purge End Time:	N/A	Breathing Zone: Well:				
	1			Water Q	uality Param				
		ime	± 3%		21	meter Measurer	nents		Drawdown
Time	(Gallons	or Liters)	(Min ± 0.2 °C)	± 0.1	± 3%	± 10 mV	±10%	± 10%	< 0.3 ft
	Change	Total	Temperature	pH (std units)	Conductivity (mS/cm)	ORP	DO (mag (l))	Turbidity (NTU)	Water Level
			(°C)	(sta units)	(ms/cm)	(mV)	(mg/L)		(feet btoc)
· · · · · · · · · · · · · · · · · · ·									
	-			//					
		'n	Y //		fell				
			1 Xt						
					Or A				
				aver	lit				
			CARIS	DYES 4					
			en	av.					
			CEN						
	1/1	1							
1		1							
	-								
K									
Notes:	150 4 -	el chart a s		1000 40	Sample Collection	(Sample ID, Analys	es, No. Containers,	Preservatives, etc.)	
Ace	UTH MO	N TWO	RECAS RECAN	Kenner			/		
4.55	100	erci 2011	w/ 2 1/2"	bolts		12	٨		
NO	FREE	Phone	ict obs,				1+		
			WIH MOUN	T					
- 1.00	1 - mine		IN POOR					the second s	

Constants: Casing Diameter (in) / Gallons per Linear Foot: 1.25 / 0.041 2 / 0.163 4 / 0.653 6 / 1.47 8 / 2.61 Parameter stability: 4 consecutive readings for 3 parameters (4 if using temperature )are within ranges indicated above.

MW -35

9/5	5/17	GRO	DUNDW			-	GING D	DATA	
Project No.			Project Name:	S	ite Informati	on			
Project No.	2393	ØI	f.	AE GW	MOUTTOR	ING	Sheet	of	
ADEC QEP:	CIFE	4	Purge Date:	SA	Sampling Date:	A	Well ID: MU	-35	
Weather:	5051	= . L	IGHT WIN	ARRCANT	Site Notes: W	ELL DE	STROTED		
2.000	1			Well D	ata and Calc				
Depth to GV	N (ft btoc):	NA		We	Il Purge Calculat	ions (Casing /B	orehole/Parame	ters)	
TOC Stickup	o (ft): 🔔 🕇	3	Casin Borebol	q Purge = Depth	n casing - depth a casing depth o	W or top filter	pack[submerge	d well] * qal/ft(c	asing)
Well TOC El	evation (ft):	?	DEFAULT PURG	E (3 Volumes)	reasing depths	Gaa of top filter	packisucanerge	u wenj gantu	
Well Casing	Depth (ft bi	toc)	Casing Purge =		ft	ft)	gal/ft *3 =	gal *3.794	jal =L
Well Condit		6,13	Borehole Purg	( I		ft) •	qal/ft *3 =	gal *3.79 L/g	gal≖ L
	STROYE	OBY	MAX PURGE (10	Volumes)	/				
WER	own he	TUTY	Casing Purge =	(f	t	ft) •	gal/ft *10 =	gal *3.79 L/g	al =L
			Borehole Purge = (			t)*	al/ft *10 =	gal *3.79 L/g	a] =L
<b>Churt 6</b> 1			1. 1. m	Purge	and Samplin	ig Data			
Start Color:	N/		Sampling Depth (f	t btoc): N/A	Tubing Length (ft)	NA	Equipment Used:	FACE PRO	15
End Color:	NI	L	Purge Start Time:	NA	PID Readi Ambient:	ngs (ppm)	CINTER	me rko	DIC
Odor:	NIN	¥	Purge End Time:	NA	Breathing Zone: Well:	N/A			
	40/10 Hite,	1.64 -1	CONSTRUCT	Water Q	uality Param	eter Data			
	Volu	ıme			Para	meter Measurer	nents		
Time	(Gallons	or Liters)	± 3% (Min ± 0.2 °C)	± 0.1	± 3%	± 10 mV	± 10%	± 10%	Drawdown
Time			Temperature	рH	Conductivity	ORP	DO	Turbidity	< 0.3 ft Water Level
	Change	Total	(°C)	(std units)	(mS/cm)	(mV)	(mg/L)	(NTU)	(feet btoc)
							2		
								<u> </u>	
				$\chi$ //	1				
				$\Lambda Z I$					
			lh	$  \mathcal{T}  $					
						El			
			1/ Mal	10	2	the second			
						-			
		/_				al			
				COV.	02				
			CH	US TOTAL	alsta				
	//			· · · · ·	V				
		1							
	J	_/							
								5 <sup>1</sup>	
Notes: W	ELLE	Rote	N OFF A	-	Sample Collection	(Sample ID, Analys	es, No. Containers,	Preservatives, etc.	
nz	PT A	65 0	KING O	OF 15 P		1			1
						15/1			
			CASING :			NA			
WBE	LUTOMT	R. N	O MONUME	NT COLANED					

Constants: Casing Diameter (in) / Gallons per Linear Foot: 1.25 / 0.041 2 / 0.163 4 / 0.653 6 / 1.47 8 / 2.61 Parameter stability: 4 consecutive readings for 3 parameters (4 if using temperature )are within ranges indicated above.

MW-36

9/1-	7/17	GRO	DUNDW			-	Ind C	ATA		
				S	ite Informati	on				
PTOJECT NO.	2393	61	Project Name: 🗲	FAT GL	V NONT	ORING	Sheet:	of		
ADEC QEP:	CIFE	ELC	Purge Date:		Sampling Date: <	7/7/17	Well ID: ML	J-36		
Weather:	405 F	M	10001,0-	2 MPH WIND	Site Notes:	P No e	The PROC			
				Well D	ata and Calc		440 1100	001 002		
Depth to G	W (ft btoc)	7.33			ll Purge Calculat					
TOC Sticku	p (ft): - Q	521	Casin Borebol	g Purge = Depth	n casing – depth reasing – depth	GW or top filter	pack[submerge	d well] gal/ft(c	asing)	
-	evation (ft):	2	DEFAULT PURG	E (3 Volumes)	rcasing – deptin	Gw of tep filter	pack[submerge	arwenj qan/it(b	orenoie)	
Well Casing	) Depth (ft b	195 00	Casing Purge =	f	ft	_ft) *	gai/ft *3 =	gal *3.79 L/g	L_L	
Well Condi		19.99	Borehole Purge =		1	ft) •	gal/ft *3 =	gal *3.79 L/c	gal =L	
	200		MAX-PORGE (10	) Volumes)						
BOLTS	work	_	Casing Purge =	fl	t	ft)*	gal/ft *10 =	gal *3.79 L/g	al =L	
J-PLUG IN TACT Borehole Purge = ( ft - ft) gal/ft *10 = gal *3.79 L/gal = L										
Start Color			Sampling Denth /4	Purge	and Samplin		Fauinment Lized			
	Start Color: Sampling Depth (ft btoc): 1/4 Tubing Length (ft): 1/4 Equipment Used: End Color: Purge Start Time: PID Readings (ppm) INTERFACE PROBE									
End Color:	_N/	4	Purge Start Time:	N/A_	Ambient:	nqs (ppm)				
Odor:		-	Purge End Time:	1~1/4	Breathing Zone: Well:	NIA		*		
		5. 		Water Q	uality Param			2007		
	1	ume	± 3%		Para	meter Measurer	nents I		Drawdown	
Time	(Gallons	or Liters)	(Min ± 0.2 °C)	± 0.1	± 3%	± 10 mV	± 10%	± 10%	< 0.3 ft	
	Change	Total	Temperature	рН	Conductivity	ORP	DO	Turbidity	Water Level	
	change	Total	(°C)	(std units)	(mS/cm)	(mV)	(mg/L)	(NTU)	(feet btoc)	
								-71		
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Notes: NO FREK PRODUCT 6" DIAM NEWSH MOUNT 7/16 BOUTS 2" DIAM DVC LVELL, Sample Collection (Sample ID, Analyses, No. Containers, Preservatives, etc.): NA NA NA									:	
X	10 FR.	er f	RODULT							
. 14 .	·	a series	Arrest			٨	JA			
6 0	RACA 1	VOLIJSH					v st			
7/1	5 BOLT	5	e larest							
Completent	- UIA	N VV	curu,		(0.041 ) (0.1	62 4/0652	6 1 4 AT 0 10	<i>ca</i>		

**Constants:** Casing Diameter (in) / Gallons per Linear Foot: 1.25 / 0.041 2 / 0.163 4 / 0.653 6 / 1.47 8 / 2.61 **Parameter stability:** 4 consecutive readings for 3 parameters (4 if using temperature ) are within ranges indicated above.

# APPENDIX D CHEMICAL DATA SUMMARY

### 2017 Groundwater Monitoring Report: Chemical Data Summary FAI - Hydrant Fuel System Site

R&M Project No.: 2393.01		Field Sample ID:	FAI17-MW1R	FAI17-MW8R	FAI17-MW15	FAI17-MW18	FAI17-MW30R
		SGS Lab Sample ID:	1178345001	1178345002	1178345003	1178345004	1178345005
Description	Location ID:		MW1R	MW1R	MW15	MW18	MW30R
Description: FAI - Hydrant		Sample Type:	Primary	Duplicate	Primary	Primary	Primary
Fuel System Site	Matrix		Water (Surface, Eff., Ground)				
Fuel System Site		Date Sampled:	2017/09/06 15:13:00	2017/09/06 15:15:00	2017/09/07 09:21:00	2017/09/06 17:21:00	2017/09/06 10:04:00
		Units:	mg/L	mg/L	mg/L	mg/L	mg/L
Analysis	Analyte	Cleanup Level <sup>1</sup>			Results <sup>2,3</sup>		
AK101 8021B	Gasoline-Range Organics	2.2	0.0602 J, QN	0.0384 J, QN	1.27 MH, QN	4.35 MH, QN	0.0500 U, QN
AK102 LV	Diesel-Range Organics	1.5	0.933	0.830	1.20	12.4	1.29
AK101 8021B	Benzene	0.0046	0.000250 U	0.000250 U	0.000320 J	0.0563	0.000250 U
AK101 8021B	Toluene	1.1	0.000500 U	0.000500 U	0.000500 U	0.0138	0.000500 U
AK101 8021B	Ethylbenzene	0.015	0.000500 U	0.000500 U	0.0615	0.245	0.000500 U
AK101 8021B	P & M -Xylene	See Xylenes (total)	0.00100 U	0.00100 U	0.401	1.32	0.00100 U
AK101 8021B	o-Xylene	See Xylenes (total)	0.000500 U	0.000500 U	0.0508	0.529	0.000500 U
AK101 8021B	Xylenes (total)	0.19	0.00150 U	0.00150 U	0.452	1.85	0.00150 U

Notes:

1 Cleanup levels are based on the most stringent 18 AAC 75 groundwater cleanup levels (ADEC, 2017a).

2 Results that were non-detect are reported as the limit of detection (LOD) with a U flag. The LOD is one-half of the limit of quantitation (LOQ).

3 Results with a detected concentration exceeding a cleanup level are highlighted red and are in BOLD text.

### Flagging Notes:

U Flag: Result was not detected above the limit of detection (LOD).

J Flag: Result refers to a concentration greater than the LOD but below the limit of quantitation (LOQ) and is estimated.

MH Flag: Result is an estimated value due to matrix affects and is considered to have a high bias.

QN Flag: Result is an estimated value twith unknown bias due to a deficiency in quality criteria.

# APPENDIX E LEVEL 2 LABORATORY RESULTS



#### Laboratory Report of Analysis

To: R & M Consultants Inc 9101 Vanguard Dr Anchorage, AK 99507 (907)646-9655

Report Number: **1178345** 

Client Project: 239.01 FAI GW Monitoring

Dear Christopher Fell,

Enclosed are the results of the analytical services performed under the referenced project for the received samples and associated QC as applicable. The samples are certified to meet the requirements of the National Environmental Laboratory Accreditation Conference Standards. Copies of this report and supporting data will be retained in our files for a period of ten years in the event they are required for future reference. All results are intended to be used in their entirety and SGS is not responsible for use of less than the complete report. Any samples submitted to our laboratory will be retained for a maximum of fourteen (14) days from the date of this report unless other archiving requirements were included in the quote.

If there are any questions about the report or services performed during this project, please call Stephen at (907) 562-2343. We will be happy to answer any questions or concerns which you may have.

Thank you for using SGS North America Inc. for your analytical services. We look forward to working with you again on any additional analytical needs.

Stephen Ede 2017.09.15 Sincerely, SGS North America Inc. Alaska Division Technical Director 15:36:32 -08'00'

Stephen Ede Project Manager Stephen.Ede@sgs.com Date

Print Date: 09/15/2017 2:15:03PM

SGS North America Inc.

200 West Potter Drive, Anchorage, AK 99518 t 907.562.2343 f 907.561.5301 www.us.sgs.com



#### **Case Narrative**

SGS Client: **R & M Consultants Inc** SGS Project: **1178345** Project Name/Site: **239.01 FAI GW Monitoring** Project Contact: **Christopher Fell** 

Refer to sample receipt form for information on sample condition.

#### FAI17-MW15 (1178345003) PS

AK101 - Surrogate recovery for 4-bromofluorobenzene (269 %) does not meet QC criteria due to matrix interference.

#### FAI17-MW18 (1178345004) PS

AK101 - Surrogate recovery for 4-bromofluorobenzene (157 %) does not meet QC criteria due to matrix interference.

\*QC comments may be associated with the field samples found in this report. When applicable, comments will be applied to associated field samples.

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#### Laboratory Qualifiers

Enclosed are the analytical results associated with the above work order. All results are intended to be used in their entirety and SGS is not responsible for use of less than the complete report. This document is issued by the Company under its General Conditions of Service accessible at <<u>http://www.sgs.com/en/Terms-and-Conditions.aspx></u>. Attention is drawn to the limitation of liability, indenmification and jurisdiction issues defined therein.

Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. Any unauthorized alteration, forgery or falsification of the context or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

SGS maintains a formal Quality Assurance/Quality Control (QA/QC) program. A copy of our Quality Assurance Plan (QAP), which outlines this program, is available at your request. The laboratory certification numbers are AK00971 (DW Chemistry & Microbiology) & UST-005 (CS) for ADEC and 2944.01 for DOD ELAP/ISO17025 (RCRA methods: 1020B, 1311, 3010A, 3050B, 3520C, 3550C, 5030B, 5035A, 6020A, 7470A, 7471B, 8015C, 8021B, 8082A, 8260C, 8270D, 8270D-SIM, 9040C, 9045D, 9056A, 9060A, AK101 and AK102/103). Except as specifically noted, all statements and data in this report are in conformance to the provisions set forth by the SGS QAP and, when applicable, other regulatory authorities.

The following descriptors or qualifiers may be found in your report:

*	The analyte has exceeded allowable regulatory or control limits.
!	Surrogate out of control limits.
В	Indicates the analyte is found in a blank associated with the sample.
CCV/CVA/CVB	Continuing Calibration Verification
CCCV/CVC/CVCA/CVCB	Closing Continuing Calibration Verification
CL	Control Limit
DF	Analytical Dilution Factor
DL	Detection Limit (i.e., maximum method detection limit)
E	The analyte result is above the calibrated range.
GT	Greater Than
IB	Instrument Blank
ICV	Initial Calibration Verification
J	The quantitation is an estimation.
LCS(D)	Laboratory Control Spike (Duplicate)
LLQC/LLIQC	Low Level Quantitation Check
LOD	Limit of Detection (i.e., 1/2 of the LOQ)
LOQ	Limit of Quantitation (i.e., reporting or practical quantitation limit)
LT	Less Than
MB	Method Blank
MS(D)	Matrix Spike (Duplicate)
ND	Indicates the analyte is not detected.
RPD	Relative Percent Difference
U	Indicates the analyte was analyzed for but not detected.
<b>.</b>	

Note: Sample summaries which include a result for "Total Solids" have already been adjusted for moisture content. All DRO/RRO analyses are integrated per SOP.

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	:	Sample Summary	,	
Client Sample ID	Lab Sample ID	Collected	Received	Matrix
FAI17-MW1R	1178345001	09/06/2017	09/08/2017	Water (Surface, Eff., Ground)
FAI17-MW8R	1178345002	09/06/2017	09/08/2017	Water (Surface, Eff., Ground)
FAI17-MW15	1178345003	09/07/2017	09/08/2017	Water (Surface, Eff., Ground)
FAI17-MW18	1178345004	09/06/2017	09/08/2017	Water (Surface, Eff., Ground)
FAI17-MW30R	1178345005	09/06/2017	09/08/2017	Water (Surface, Eff., Ground)
FAI17-QC-TB01	1178345006	09/06/2017	09/08/2017	Water (Surface, Eff., Ground)

Method AK101 SW8021B AK102

### Method Description

AK101/8021 Combo. AK101/8021 Combo. DRO Low Volume (W)

Print Date: 09/15/2017 2:15:06PM



Detectable Results	s Summary
--------------------	-----------

Client Sample ID: FAI17-MW1R Lab Sample ID: 1178345001 Semivolatile Organic Fuels Volatile Fuels	<u>Parameter</u> Diesel Range Organics Gasoline Range Organics	<u>Result</u> 0.933 0.0602J	<u>Units</u> mg/L mg/L
Client Sample ID: FAI17-MW8R Lab Sample ID: 1178345002	Parameter	Result	<u>Units</u>
Semivolatile Organic Fuels	Diesel Range Organics	0.830	mg/L
Volatile Fuels	Gasoline Range Organics	0.0384J	mg/L
Client Sample ID: <b>FAI17-MW15</b> Lab Sample ID: 1178345003	Deventer	Desut	11-34-
	<u>Parameter</u> Diesel Range Organics	<u>Result</u> 1.20	<u>Units</u>
Semivolatile Organic Fuels Volatile Fuels	Benzene	0.320J	mg/L ug/L
Volatile Fuels	Ethylbenzene	61.5	ug/L
	Gasoline Range Organics	1.27	mg/L
	o-Xylene	50.8	ug/L
	P & M -Xylene	401	ug/L
			~ <u>9</u> /=
Client Sample ID: FAI17-MW18			
Lab Sample ID: 1178345004	Parameter	Result	<u>Units</u>
Semivolatile Organic Fuels	Diesel Range Organics	12.4	mg/L
Volatile Fuels	Benzene	56.3	ug/L
	Ethylbenzene	245	ug/L
	Gasoline Range Organics	4.35	mg/L
	o-Xylene	529	ug/L
	P & M -Xylene	1320	ug/L
	Toluene	13.8	ug/L
Client Sample ID: FAI17-MW30R			
Lab Sample ID: 1178345005	<u>Parameter</u>	<u>Result</u>	<u>Units</u>
Semivolatile Organic Fuels	Diesel Range Organics	1.29	mg/L

Print Date: 09/15/2017 2:15:08PM

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Results of FAI17-MW1R Client Sample ID: FAI17-MW1R Collection Date: 09/06/17 15:13 Received Date: 09/08/17 09:40 Client Project ID: 239.01 FAI GW Monitoring Lab Sample ID: 1178345001 Matrix: Water (Surface, Eff., Ground) Lab Project ID: 1178345 Solids (%): Location: MW1R Results by Semivolatile Organic Fuels Allowable Parameter Result Qual LOQ/CL DL <u>Units</u> DF Date Analyzed Limits **Diesel Range Organics** 0.933 0.577 0.173 mg/L 1 09/15/17 03:40 Surrogates 5a Androstane (surr) 82.9 50-150 % 1 09/15/17 03:40 **Batch Information** Analytical Batch: XFC13797 Prep Batch: XXX38399 Prep Method: SW3520C Analytical Method: AK102 Analyst: KMD Prep Date/Time: 09/12/17 08:10 Analytical Date/Time: 09/15/17 03:40 Prep Initial Wt./Vol.: 260 mL Container ID: 1178345001-D Prep Extract Vol: 1 mL

Print Date: 09/15/2017 2:15:09PM

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Results of FAI17-MW1R Client Sample ID: FAI17-MW1R Client Project ID: 239.01 FAI GW Monitoring Lab Sample ID: 1178345001 Lab Project ID: 1178345		( F M S					
Results by Volatile Fuels							
		1.00/01	D.		55	Allowable	
<u>Parameter</u> Gasoline Range Organics	<u>Result Qual</u> 0.0602 J	<u>LOQ/CL</u> 0.100	<u>DL</u> 0.0310	<u>Units</u> mg/L	<u>DF</u> 1	<u>Limits</u>	Date Analyze 09/09/17 04:5
	0.0002 J	0.100	0.0310	mg/∟	1		09/09/17 04.5
urrogates							
I-Bromofluorobenzene (surr)	92	50-150		%	1		09/09/17 04:5
Batch Information							
Analytical Batch: VFC13865 Analytical Method: AK101 Analyst: ST Analytical Date/Time: 09/09/17 04:50 Container ID: 1178345001-A			Prep Batch: Prep Method: Prep Date/Tir Prep Initial W Prep Extract	SW5030B ne: 09/08/1 t./Vol.: 5 m	7 08:00		
						Allowable	
Parameter	Result Qual	LOQ/CL	DL	<u>Units</u>	<u>DF</u>	Limits	Date Analyze
Benzene	0.250 U	0.500	0.150	ug/L	1		09/09/17 04:5
Ethylbenzene	0.500 U	1.00	0.310	ug/L	1		09/09/17 04:
-Xylene	0.500 U	1.00	0.310	ug/L	1		09/09/17 04:
P & M -Xylene	1.00 U 0.500 U	2.00	0.620	ug/L	1		09/09/17 04:
Toluene	0.500 0	1.00	0.310	ug/L	1		09/09/17 04:
irrogates							
,4-Difluorobenzene (surr)	89.8	77-115		%	1		09/09/17 04:
Batch Information							
Analytical Batch: VFC13865 Analytical Method: SW8021B Analyst: ST Analytical Date/Time: 09/09/17 04:50 Container ID: 1178345001-A			Prep Batch: ' Prep Method: Prep Date/Tir Prep Initial W Prep Extract '	SW5030B ne: 09/08/1 t./Vol.: 5 m	7 08:00		

Print Date: 09/15/2017 2:15:09PM

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Client Sample ID: FAI17-MW8R Client Project ID: 239.01 FAI GW Monitoring Lab Sample ID: 1178345002 Lab Project ID: 1178345			Collection Date: 09/06/17 15:15 Received Date: 09/08/17 09:40 Matrix: Water (Surface, Eff., Ground) Solids (%): Location: MW8R					
Fuels								
<u>Result Qual</u> 0.830	<u>LOQ/CL</u> 0.588	<u>DL</u> 0.176	<u>Units</u> mg/L	<u>DF</u> 1	<u>Allowable</u> Limits	Date Analyzed 09/15/17 04:01		
85.1	50-150		%	1		09/15/17 04:01		
01	Prep Batch: XXX38399 Prep Method: SW3520C Prep Date/Time: 09/12/17 08:10 Prep Initial Wt./Vol.: 255 mL Prep Extract Vol: 1 mL							
	Fuels Result Qual 0.830 85.1	Monitoring Ra Mo Fuels Result Qual LOQ/CL 0.830 0.588 85.1 50-150	Monitoring Received Da Matrix: Wate Solids (%): Location: MV Fuels <u>Result Qual</u> LOQ/CL DL 0.830 0.588 0.176 85.1 50-150 Prep Batch: Prep Method Prep Date/Tii Prep Initial W	Monitoring       Received Date: 09/08/^ Matrix: Water (Surface, Solids (%): Location: MW8R         Fuels       Image: Comparison of the second sec	Monitoring         Received Date:         09/08/17         09:40           Matrix: Water (Surface, Eff., Gro Solids (%): Location:         MW8R           Fuels         Units         DF           0.830         0.588         0.176         mg/L         1           85.1         50-150         %         1           Prep Batch: XXX38399 Prep Method:           Prep Date/Time:         09/12/17         08:10           01         Prep Initial Wt./Vol.:         255 mL	Monitoring       Received Date: 09/08/17 09:40 Matrix: Water (Surface, Eff., Ground) Solids (%): Location: MW8R         Fuels       Allowable Limits         Result Qual 0.830       LOQ/CL 0.588       DL 0.176       Units mg/L       DF 1       Allowable Limits         85.1       50-150       %       1         Prep Batch: XXX38399 Prep Method: SW3520C Prep Date/Time: 09/12/17 08:10 Prep Initial Wt./Vol.: 255 mL		

Print Date: 09/15/2017 2:15:09PM

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Results of FAI17-MW8R								
Client Sample ID: FAI17-MW8R Client Project ID: 239.01 FAI GW Mo Lab Sample ID: 1178345002 Lab Project ID: 1178345	onitoring	Collection Date: 09/06/17 15:15 Received Date: 09/08/17 09:40 Matrix: Water (Surface, Eff., Ground) Solids (%): Location: MW8R						
Results by Volatile Fuels								
Parameter	Result Qual	LOQ/CL	<u>DL</u>	<u>Units</u>	<u>DF</u>	Allowable Limits	Date Analyzed	
Gasoline Range Organics	0.0384 J	0.100	0.0310	mg/L	1		09/09/17 05:09	
urrogates								
4-Bromofluorobenzene (surr)	93.1	50-150		%	1		09/09/17 05:09	
Batch Information								
Analytical Batch: VFC13865 Analytical Method: AK101 Analyst: ST Analytical Date/Time: 09/09/17 05:09 Container ID: 1178345002-A			Prep Batch: ` Prep Method: Prep Date/Tir Prep Initial W Prep Extract `	: SW5030B me: 09/08/1 ′t./Vol.: 5 m	7 08:00			
Deremeter	Popult Qual			Linito	DE	Allowable	Data Analyzad	
<u>Parameter</u> Benzene	<u>Result Qual</u> 0.250 U	<u>LOQ/CL</u> 0.500	<u>DL</u> 0.150	<u>Units</u> ug/L	<u>DF</u> 1	<u>Limits</u>	Date Analyzed 09/09/17 05:09	
Ethylbenzene	0.500 U	1.00	0.310	ug/L	1		09/09/17 05:09	
o-Xylene	0.500 U	1.00	0.310	ug/L	1		09/09/17 05:09	
P & M -Xylene	1.00 U	2.00	0.620	ug/L	1		09/09/17 05:09	
Toluene	0.500 U	1.00	0.310	ug/L	1		09/09/17 05:09	
urrogates								
1,4-Difluorobenzene (surr)	87.7	77-115		%	1		09/09/17 05:09	
Batch Information								
Analytical Batch: VFC13865 Analytical Method: SW8021B Analyst: ST Analytical Date/Time: 09/09/17 05:09 Container ID: 1178345002-A			Prep Batch: Prep Method: Prep Date/Tir Prep Initial W Prep Extract	: SW5030B me: 09/08/1 't./Vol.: 5 m	7 08:00			

J flagging is activated



Results of FAI17-MW15 Client Sample ID: FAI17-MW15 Client Project ID: 239.01 FAI GW Mon Lab Sample ID: 1178345003 Lab Project ID: 1178345	lient Sample ID: <b>FAI17-MW15</b> lient Project ID: <b>239.01 FAI GW Monitoring</b> ab Sample ID: 1178345003 ab Project ID: 1178345					Collection Date: 09/07/17 09:21 Received Date: 09/08/17 09:40 Matrix: Water (Surface, Eff., Ground) Solids (%): Location: MW15						
Results by Semivolatile Organic Fuels	6											
Parameter Diesel Range Organics	<u>Result Qual</u> 1.20	<u>LOQ/CL</u> 0.566	<u>DL</u> 0.170	<u>Units</u> mg/L	<u>DF</u> 1	<u>Allowable</u> <u>Limits</u>	Date Analyzed 09/15/17 04:22					
Surrogates 5a Androstane (surr)	81.5	50-150		%	1		09/15/17 04:22					
Batch Information Analytical Batch: XFC13797 Analytical Method: AK102 Analyst: KMD Analytical Date/Time: 09/15/17 04:22 Container ID: 1178345003-D		F F F F										

J flagging is activated

Results by Volatile Fuels		Collection Date: 09/07/17 09:21 Received Date: 09/08/17 09:40 Matrix: Water (Surface, Eff., Ground) Solids (%): Location: MW15						
			_					
Parameter	Result Qual	LOQ/CL	DL	<u>Units</u>	<u>DF</u>	Allowable Limits	Date Analyzed	
Gasoline Range Organics	1.27	0.100	0.0310	mg/L	1		09/12/17 00:21	
Surrogates								
4-Bromofluorobenzene (surr)	269 *	50-150		%	1		09/12/17 00:21	
Batch Information								
Analytical Batch: VFC13873 Analytical Method: AK101 Analyst: ST Analytical Date/Time: 09/12/17 00:21 Container ID: 1178345003-A			Prep Batch: \ Prep Method: Prep Date/Tin Prep Initial W Prep Extract \	SW5030B ne: 09/11/1 t./Vol.: 5 m	7 08:00			
Deverator	Desult Quel	100/01		Linite	DE	Allowable	Data Analyzad	
Parameter Benzene	<u>Result Qual</u> 0.320 J	<u>LOQ/CL</u> 0.500	<u>DL</u> 0.150	<u>Units</u> ug/L	<u>DF</u> 1	<u>Limits</u>	Date Analyzed 09/12/17 00:21	
Ethylbenzene	61.5	1.00	0.310	ug/L	1		09/12/17 00:21	
o-Xylene	50.8	1.00	0.310	ug/L	1		09/12/17 00:21	
P & M -Xylene	401	2.00	0.620	ug/L	1		09/12/17 00:21	
Toluene	0.500 U	1.00	0.310	ug/L	1		09/12/17 00:21	
Surrogates								
1,4-Difluorobenzene (surr)	88.9	77-115		%	1		09/12/17 00:21	
Batch Information								
Analytical Batch: VFC13873 Analytical Method: SW8021B Analyst: ST Analytical Date/Time: 09/12/17 00:21 Container ID: 1178345003-A			Prep Batch: Prep Method: Prep Date/Tin Prep Initial W Prep Extract V	SW5030B ne: 09/11/1 t./Vol.: 5 m	7 08:00			



Results of FAI17-MW18 Client Sample ID: FAI17-MW18 Collection Date: 09/06/17 17:21 Received Date: 09/08/17 09:40 Client Project ID: 239.01 FAI GW Monitoring Lab Sample ID: 1178345004 Matrix: Water (Surface, Eff., Ground) Lab Project ID: 1178345 Solids (%): Location: MW18 Results by Semivolatile Organic Fuels Allowable Parameter Result Qual LOQ/CL DL <u>Units</u> <u>DF</u> Date Analyzed Limits **Diesel Range Organics** 12.4 0.566 0.170 mg/L 1 09/15/17 04:43 Surrogates 5a Androstane (surr) 82.6 50-150 % 1 09/15/17 04:43 **Batch Information** Analytical Batch: XFC13797 Prep Batch: XXX38399 Prep Method: SW3520C Analytical Method: AK102 Analyst: KMD Prep Date/Time: 09/12/17 08:10 Analytical Date/Time: 09/15/17 04:43 Prep Initial Wt./Vol.: 265 mL Container ID: 1178345004-D Prep Extract Vol: 1 mL

Print Date: 09/15/2017 2:15:09PM

J flagging is activated

Client Sample ID: <b>FAI17-MW18</b> Client Project ID: <b>239.01 FAI GW Mo</b> Lab Sample ID: 1178345004 Lab Project ID: 1178345	nitoring	Collection Date: 09/06/17 17:21 Received Date: 09/08/17 09:40 Matrix: Water (Surface, Eff., Ground) Solids (%): Location: MW18						
Results by Volatile Fuels								
		1.00/01			55	Allowable		
Parameter Gasoline Range Organics	<u>Result Qual</u> 4.35	<u>LOQ/CL</u> 0.500	<u>DL</u> 0.155	<u>Units</u> mg/L	<u>DF</u> 5	<u>Limits</u>	Date Analyze 09/12/17 14:0	
	4.00	0.500	0.155	ilig/L	5		03/12/17 14.0	
Surrogates	457 +	50 450		0/	-		00/40/47 44	
4-Bromofluorobenzene (surr)	157 *	50-150		%	5		09/12/17 14:0	
Batch Information								
Analytical Batch: VFC13875 Analytical Method: AK101 Analyst: ST Analytical Date/Time: 09/12/17 14:05 Container ID: 1178345004-B			Prep Batch: Prep Method Prep Date/Ti Prep Initial V Prep Extract	l: SW5030B me: 09/12/1 /t./Vol.: 5 m	17 08:00			
<b>_</b>						Allowable		
<u>Parameter</u> Benzene	<u>Result Qual</u> 56.3	<u>LOQ/CL</u> 2.50	<u>DL</u> 0.750	<u>Units</u>	<u>DF</u> 5	<u>Limits</u>	Date Analyze 09/12/17 14:0	
Ethylbenzene	245	2.50 5.00	1.55	ug/L ug/L	5 5		09/12/17 14:0	
o-Xylene	529	5.00	1.55	ug/L	5		09/12/17 14:0	
P & M -Xylene	1320	10.0	3.10	ug/L	5		09/12/17 14:0	
Toluene	13.8	5.00	1.55	ug/L	5		09/12/17 14:0	
urrogates								
1,4-Difluorobenzene (surr)	92	77-115		%	5		09/12/17 14:0	
Batch Information								
Analytical Batch: VFC13875 Analytical Method: SW8021B Analyst: ST Analytical Date/Time: 09/12/17 14:05 Container ID: 1178345004-B			Prep Batch: Prep Method Prep Date/Ti Prep Initial V Prep Extract	l: SW5030B me: 09/12/1 /t./Vol.: 5 m	17 08:00			
Analytical Date/Time: 09/12/17 14:05			Prep Initial V	Vt./Vol.: 5 m				

J flagging is activated



Results of FAI17-MW30R Client Sample ID: FAI17-MW30R Collection Date: 09/06/17 10:04 Received Date: 09/08/17 09:40 Client Project ID: 239.01 FAI GW Monitoring Lab Sample ID: 1178345005 Matrix: Water (Surface, Eff., Ground) Lab Project ID: 1178345 Solids (%): Location: MW30R Results by Semivolatile Organic Fuels Allowable Parameter Result Qual LOQ/CL DL <u>Units</u> <u>DF</u> Date Analyzed Limits **Diesel Range Organics** 1.29 0.588 0.176 mg/L 1 09/15/17 05:03 Surrogates 5a Androstane (surr) 79.1 50-150 % 1 09/15/17 05:03 **Batch Information** Analytical Batch: XFC13797 Prep Batch: XXX38399 Prep Method: SW3520C Analytical Method: AK102 Analyst: KMD Prep Date/Time: 09/12/17 08:10 Analytical Date/Time: 09/15/17 05:03 Prep Initial Wt./Vol.: 255 mL Container ID: 1178345005-D Prep Extract Vol: 1 mL

Print Date: 09/15/2017 2:15:09PM

J flagging is activated

Results of FAI17-MW30R Client Sample ID: FAI17-MW30R Client Project ID: 239.01 FAI GW Mon Lab Sample ID: 1178345005 Lab Project ID: 1178345	itoring	Collection Date: 09/06/17 10:04 Received Date: 09/08/17 09:40 Matrix: Water (Surface, Eff., Ground) Solids (%): Location: MW30R							
Results by Volatile Fuels			]						
Parameter Gasoline Range Organics	<u>Result Qual</u> 0.0500 U	<u>LOQ/CL</u> 0.100	<u>DL</u> 0.0310	<u>Units</u> mg/L	<u>DF</u> 1	Allowable Limits	Date Analyzed 09/12/17 15:20		
Surrogates 4-Bromofluorobenzene (surr)	90.8	50-150		%	1		09/12/17 15:20		
Batch Information									
Analytical Batch: VFC13875 Analytical Method: AK101 Analyst: ST Analytical Date/Time: 09/12/17 15:20 Container ID: 1178345005-B		F F	Prep Batch: Prep Method: Prep Date/Tir Prep Initial W Prep Extract	: SW5030B me: 09/12/1 /t./Vol.: 5 m	7 08:00				
Parameter	Result Qual	LOQ/CL	<u>DL</u>	<u>Units</u>	DF	Allowable Limits	Date Analyzed		
Benzene Ethylbenzene	0.250 U 0.500 U	0.500 1.00	0.150 0.310	ug/L ug/L	1 1		09/12/17 15:20 09/12/17 15:20		
o-Xylene	0.500 U	1.00	0.310	ug/L	1		09/12/17 15:20		
P & M -Xylene	1.00 U	2.00	0.620	ug/L	1		09/12/17 15:20		
Toluene	0.500 U	1.00	0.310	ug/L	1		09/12/17 15:20		
Surrogates									
1,4-Difluorobenzene (surr)	88.2	77-115		%	1		09/12/17 15:20		
Batch Information									
Analytical Batch: VFC13875 Analytical Method: SW8021B Analyst: ST Analytical Date/Time: 09/12/17 15:20 Container ID: 1178345005-B		F F	Prep Batch: Prep Method: Prep Date/Tir Prep Initial W Prep Extract	: SW5030B me: 09/12/1 /t./Vol.: 5 m	7 08:00				

J flagging is activated

Results by <b>Volatile Fuels</b> <u>Parameter</u> Gasoline Range Organics <b>Gurrogates</b> 4-Bromofluorobenzene (surr)	<u>Result Qual</u> 0.0500 U	LOQ/CL	_				
Gasoline Range Organics currogates		LOQ/CL					
Gasoline Range Organics currogates		LOQ/CL				Allowable	
urrogates	0.0500 0	0.100	<u>DL</u>	<u>Units</u>	<u>DF</u> 1	<u>Limits</u>	Date Analyzed
-		0.100	0.0310	mg/L	I		09/11/17 23:24
4-Bromofluorobenzene (surr)							
	85.6	50-150		%	1		09/11/17 23:24
Batch Information							
Analytical Batch: VFC13873 Analytical Method: AK101 Analyst: ST Analytical Date/Time: 09/11/17 23:24 Container ID: 1178345006-A			Prep Batch: \ Prep Method: Prep Date/Tir Prep Initial W Prep Extract \	: SW5030B me: 09/11/1 ′t./Vol.: 5 m	7 08:00		
						Allowable	
Parameter	Result Qual	LOQ/CL	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Limits</u>	Date Analyzed
Benzene	0.250 U	0.500	0.150	ug/L	1		09/11/17 23:24
Ethylbenzene	0.500 U	1.00	0.310	ug/L	1		09/11/17 23:2
o-Xylene P & M -Xylene	0.500 U 1.00 U	1.00 2.00	0.310 0.620	ug/L ug/L	1 1		09/11/17 23:2 09/11/17 23:2
Toluene	0.500 U	2.00	0.020	ug/L ug/L	1		09/11/17 23:2
	0.500 0	1.00	0.510	ug/L			09/11/17 23.2
Surrogates	/						
1,4-Difluorobenzene (surr)	92.1	77-115		%	1		09/11/17 23:2
Batch Information							
Analytical Batch: VFC13873 Analytical Method: SW8021B Analyst: ST Analytical Date/Time: 09/11/17 23:24 Container ID: 1178345006-A			Prep Batch: \ Prep Method: Prep Date/Tir Prep Initial W Prep Extract \	: SW5030B me: 09/11/1 ′t./Vol.: 5 m	7 08:00		

J flagging is activated

Blank ID: MB for HBN 176793 Blank Lab ID: 1411618	39 [VXX/31253]	Matrix	<: Water (Surfac	ce, Eff., Ground)
2C for Samples: 178345001, 1178345002				
Results by <b>AK101</b>				
Parameter	<u>Results</u>	LOQ/CL	<u>DL</u>	<u>Units</u>
Gasoline Range Organics	0.0500U	0.100	0.0310	mg/L
urrogates				
-Bromofluorobenzene (surr)	90.8	50-150		%
atch Information				
Analytical Batch: VFC13865		Prep Ba	tch: VXX31253	
Analytical Method: AK101			ethod: SW5030B	
Instrument: Agilent 7890A P Analyst: ST	D/FID		te/Time: 9/8/201 tial Wt./Vol.: 5 m	
Analysi. OT	17 9:59:00PM		tract Vol: 5 mL	L

Print Date: 09/15/2017 2:15:10PM



Blank Spike ID: LCS for HBN 1178345 [VXX31253] Blank Spike Lab ID: 1411621 Date Analyzed: 09/08/2017 18:13 Spike Duplicate ID: LCSD for HBN 1178345 [VXX31253] Spike Duplicate Lab ID: 1411622 Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1178345001, 1178345002

Results by AK101			_						
	I	Blank Spike	e (mg/L)	S	pike Duplic				
Parameter	Spike	Result	<u>Rec (%)</u>	<u>Spike</u>	Result	<u>Rec (%)</u>	<u>CL</u>	<u>RPD (%)</u>	RPD CL
Gasoline Range Organics	1.00	0.985	99	1.00	0.954	95	(60-120)	3.20	(< 20)
Surrogates									
4-Bromofluorobenzene (surr)	0.0500	97.8	98	0.0500	93.8	94	(50-150)	4.10	
Batch Information Analytical Batch: VFC13865 Analytical Method: AK101	0.510			Prep	) Batch: V ) Method:	SW5030B	7 00 00		
Instrument: <b>Agilent 7890A Pl</b> Analyst: <b>ST</b>	D/FID			Spik	e Init Wt./\		g/L Extract \ g/L Extract \ g/L Extract V		

Print Date: 09/15/2017 2:15:12PM

#### Method Blank

Blank ID: MB for HBN 1767939 [VXX/31253] Blank Lab ID: 1411618

QC for Samples:

1178345001, 1178345002

#### Results by SW8021B

Parameter	Results	LOQ/CL	<u>DL</u>	<u>Units</u>
Benzene	0.250U	0.500	0.150	ug/L
Ethylbenzene	0.500U	1.00	0.310	ug/L
o-Xylene	0.500U	1.00	0.310	ug/L
P & M -Xylene	1.00U	2.00	0.620	ug/L
Toluene	0.500U	1.00	0.310	ug/L
Surrogates				
1,4-Difluorobenzene (surr)	89.4	77-115		%

#### **Batch Information**

Analytical Batch: VFC13865 Analytical Method: SW8021B Instrument: Agilent 7890A PID/FID Analyst: ST Analytical Date/Time: 9/8/2017 9:59:00PM Prep Batch: VXX31253 Prep Method: SW5030B Prep Date/Time: 9/8/2017 8:00:00AM Prep Initial Wt./Vol.: 5 mL Prep Extract Vol: 5 mL

Matrix: Water (Surface, Eff., Ground)

Print Date: 09/15/2017 2:15:14PM



Blank Spike ID: LCS for HBN 1178345 [VXX31253] Blank Spike Lab ID: 1411619 Date Analyzed: 09/08/2017 17:55 Spike Duplicate ID: LCSD for HBN 1178345 [VXX31253] Spike Duplicate Lab ID: 1411620 Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1178345001, 1178345002

#### Results by SW8021B

		Blank Spike	e (ug/L)	:	Spike Dupli	cate (ug/L)			
Parameter	Spike	Result	<u>Rec (%)</u>	<u>Spike</u>	Result	<u>Rec (%)</u>	CL	<u>RPD (%)</u>	RPD CL
Benzene	100	95.0	95	100	92.3	92	(80-120)	2.90	(< 20)
Ethylbenzene	100	98.7	99	100	95.7	96	(75-125)	3.10	(< 20)
o-Xylene	100	96.0	96	100	93.6	94	(80-120)	2.50	(< 20)
P & M -Xylene	200	194	97	200	189	94	(75-130)	3.10	(< 20)
Toluene	100	100	100	100	95.7	96	(75-120)	4.80	(< 20 )
Surrogates									
1,4-Difluorobenzene (surr)	50	95.8	96	50	95.8	96	(77-115)	0.04	

#### **Batch Information**

Analytical Batch: VFC13865 Analytical Method: SW8021B Instrument: Agilent 7890A PID/FID Analyst: ST Prep Batch: VXX31253 Prep Method: SW5030B Prep Date/Time: 09/08/2017 08:00 Spike Init Wt./Vol.: 100 ug/L Extract Vol: 5 mL Dupe Init Wt./Vol.: 100 ug/L Extract Vol: 5 mL

Print Date: 09/15/2017 2:15:15PM

Method Blank Blank ID: MB for HBN 17681 Blank Lab ID: 1412263 QC for Samples: 1178345003, 1178345006	68 [VXX/31273]	Matrix:	Water (Surfa	ace, Eff., Ground)	
Results by AK101		]			
<u>Parameter</u> Gasoline Range Organics	<u>Results</u> 0.0500U	<u>LOQ/CL</u> 0.100	<u>DL</u> 0.0310	<u>Units</u> mg/L	
Surrogates					
4-Bromofluorobenzene (surr)	85	50-150		%	
Batch Information					
Analytical Batch: VFC13873 Analytical Method: AK101 Instrument: Agilent 7890 PII Analyst: ST Analytical Date/Time: 9/11/2	D/FID	Prep Metl Prep Date Prep Initia	ch: VXX31273 hod: SW5030 c/Time: 9/11/2 al Wt./Vol.: 5 act Vol: 5 mL	)B 2017 8:00:00AM mL	



Blank Spike ID: LCS for HBN 1178345 [VXX31273] Blank Spike Lab ID: 1412266 Date Analyzed: 09/11/2017 18:57 Spike Duplicate ID: LCSD for HBN 1178345 [VXX31273] Spike Duplicate Lab ID: 1412267 Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1178345003, 1178345006

Results by AK101			_						
	E	Blank Spike	e (mg/L)	S	pike Duplic	cate (mg/L)			
Parameter	<u>Spike</u>	Result	Rec (%)	Spike	Result	<u>Rec (%)</u>	<u>CL</u>	<u>RPD (%)</u>	RPD CL
Gasoline Range Organics	1.00	1.05	105	1.00	0.992	99	(60-120)	5.30	(< 20 )
Surrogates									
4-Bromofluorobenzene (surr)	0.0500	91.3	91	0.0500	89.3	89	(50-150)	2.30	
Batch Information									
Analytical Batch: VFC13873				Prep	Batch: V	XX31273			
Analytical Method: AK101				Prep	Method:	SW5030B			
Instrument: Agilent 7890 PID/	FID			Prep	Date/Time	e: 09/11/201	7 08:00		
Analyst: ST							g/L Extract \		
				Dup	e Init Wt./V	/ol.: 1.00 mg	g/L Extract V	ol: 5 mL	

Print Date: 09/15/2017 2:15:19PM

#### Method Blank

Blank ID: MB for HBN 1768168 [VXX/31273] Blank Lab ID: 1412263 Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1178345003, 1178345006

#### Results by SW8021B

· ·				
Parameter	Results	LOQ/CL	<u>DL</u>	<u>Units</u>
Benzene	0.250U	0.500	0.150	ug/L
Ethylbenzene	0.500U	1.00	0.310	ug/L
o-Xylene	0.500U	1.00	0.310	ug/L
P & M -Xylene	1.00U	2.00	0.620	ug/L
Toluene	0.500U	1.00	0.310	ug/L
Surrogates				
1,4-Difluorobenzene (surr)	91.3	77-115		%

#### **Batch Information**

Analytical Batch: VFC13873 Analytical Method: SW8021B Instrument: Agilent 7890 PID/FID Analyst: ST Analytical Date/Time: 9/11/2017 10:45:00PM Prep Batch: VXX31273 Prep Method: SW5030B Prep Date/Time: 9/11/2017 8:00:00AM Prep Initial Wt./Vol.: 5 mL Prep Extract Vol: 5 mL

Print Date: 09/15/2017 2:15:20PM



Blank Spike ID: LCS for HBN 1178345 [VXX31273] Blank Spike Lab ID: 1412264 Date Analyzed: 09/11/2017 18:38 Spike Duplicate ID: LCSD for HBN 1178345 [VXX31273] Spike Duplicate Lab ID: 1412265 Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1178345003, 1178345006

#### Results by SW8021B

		Blank Spike	e (ug/L)	:	Spike Dupli	cate (ug/L)			
Parameter	Spike	Result	<u>Rec (%)</u>	<u>Spike</u>	Result	<u>Rec (%)</u>	<u>CL</u>	<u>RPD (%)</u>	RPD CL
Benzene	100	118	118	100	112	112	(80-120)	5.30	(< 20)
Ethylbenzene	100	114	114	100	108	108	(75-125)	5.70	(< 20)
o-Xylene	100	110	110	100	105	105	(80-120)	5.10	(< 20)
P & M -Xylene	200	225	112	200	213	106	(75-130)	5.60	(< 20)
Toluene	100	114	114	100	108	108	(75-120)	5.40	(< 20 )
Surrogates									
1,4-Difluorobenzene (surr)	50	101	101	50	98.8	99	(77-115)	2.00	

#### **Batch Information**

Analytical Batch: VFC13873 Analytical Method: SW8021B Instrument: Agilent 7890 PID/FID Analyst: ST Prep Batch: VXX31273 Prep Method: SW5030B Prep Date/Time: 09/11/2017 08:00 Spike Init Wt./Vol.: 100 ug/L Extract Vol: 5 mL Dupe Init Wt./Vol.: 100 ug/L Extract Vol: 5 mL

Print Date: 09/15/2017 2:15:22PM

Method Blank	
Blank ID: MB for HBN 1768247 [VXX/31283] Blank Lab ID: 1412608	Matrix: Water (Surface, Eff., Ground)
QC for Samples: 1178345004, 1178345005	
Results by AK101	
Parameter         Results           Gasoline Range Organics         0.0500U	LOQ/CL DL Units 0.100 0.0310 mg/L
Surrogates4-Bromofluorobenzene (surr)88.2	50-150 %
Batch Information	
Analytical Batch: VFC13875 Analytical Method: AK101 Instrument: Agilent 7890A PID/FID Analyst: ST Analytical Date/Time: 9/12/2017 12:12:00PM	Prep Batch: VXX31283 Prep Method: SW5030B Prep Date/Time: 9/12/2017 8:00:00AM Prep Initial Wt./Vol.: 5 mL Prep Extract Vol: 5 mL



Blank Spike ID: LCS for HBN 1178345 [VXX31283] Blank Spike Lab ID: 1412611 Date Analyzed: 09/12/2017 13:09 Spike Duplicate ID: LCSD for HBN 1178345 [VXX31283] Spike Duplicate Lab ID: 1412612 Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1178345004, 1178345005

Results by AK101									
	E	Blank Spike	e (mg/L)	S	pike Duplio	cate (mg/L)			
<u>Parameter</u>	Spike	Result	<u>Rec (%)</u>	Spike	Result	<u>Rec (%)</u>	CL	<u>RPD (%)</u>	RPD CL
Gasoline Range Organics	1.00	0.990	99	1.00	0.961	96	(60-120)	3.00	(< 20)
urrogates									
4-Bromofluorobenzene (surr)	0.0500	99.2	99	0.0500	99.3	99	(50-150)	0.18	
Batch Information Analytical Batch: VFC13875 Analytical Method: AK101 Instrument: Agilent 7890A PIL Analyst: ST	D/FID			Prep Prep Spik	e Init Wt./\	<b>SW5030B</b> e: <b>09/12/201</b> /ol.: 1.00 mg	<b>7 08:00</b> g/L Extract \ g/L Extract V		

Print Date: 09/15/2017 2:15:26PM

#### Method Blank

Blank ID: MB for HBN 1768247 [VXX/31283] Blank Lab ID: 1412608 Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1178345004, 1178345005

#### Results by SW8021B

•				
Parameter	Results	LOQ/CL	<u>DL</u>	<u>Units</u>
Benzene	0.250U	0.500	0.150	ug/L
Ethylbenzene	0.500U	1.00	0.310	ug/L
o-Xylene	0.500U	1.00	0.310	ug/L
P & M -Xylene	1.00U	2.00	0.620	ug/L
Toluene	0.500U	1.00	0.310	ug/L
Surrogates				
1,4-Difluorobenzene (surr)	88.9	77-115		%

#### **Batch Information**

Analytical Batch: VFC13875 Analytical Method: SW8021B Instrument: Agilent 7890A PID/FID Analyst: ST Analytical Date/Time: 9/12/2017 12:12:00PM Prep Batch: VXX31283 Prep Method: SW5030B Prep Date/Time: 9/12/2017 8:00:00AM Prep Initial Wt./Vol.: 5 mL Prep Extract Vol: 5 mL

Print Date: 09/15/2017 2:15:28PM



Blank Spike ID: LCS for HBN 1178345 [VXX31283] Blank Spike Lab ID: 1412609 Date Analyzed: 09/12/2017 12:50 Spike Duplicate ID: LCSD for HBN 1178345 [VXX31283] Spike Duplicate Lab ID: 1412610 Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1178345004, 1178345005

#### Results by SW8021B

		Blank Spike	e (ug/L)	:	Spike Dupli	cate (ug/L)			
<u>Parameter</u>	<u>Spike</u>	Result	<u>Rec (%)</u>	<u>Spike</u>	Result	<u>Rec (%)</u>	<u>CL</u>	<u>RPD (%)</u>	RPD CL
Benzene	100	98.0	98	100	99.4	99	(80-120)	1.50	(< 20)
Ethylbenzene	100	97.6	98	100	99.8	100	(75-125)	2.20	(< 20)
o-Xylene	100	92.6	93	100	95.9	96	(80-120)	3.60	(< 20)
P & M -Xylene	200	186	93	200	191	95	(75-130)	2.80	(< 20)
Toluene	100	98.7	99	100	100	100	(75-120)	1.60	(< 20)
Surrogates									
1,4-Difluorobenzene (surr)	50	92.4	92	50	94.1	94	(77-115)	1.80	

#### **Batch Information**

Analytical Batch: VFC13875 Analytical Method: SW8021B Instrument: Agilent 7890A PID/FID Analyst: ST Prep Batch: VXX31283 Prep Method: SW5030B Prep Date/Time: 09/12/2017 08:00 Spike Init Wt./Vol.: 100 ug/L Extract Vol: 5 mL Dupe Init Wt./Vol.: 100 ug/L Extract Vol: 5 mL

Print Date: 09/15/2017 2:15:30PM

Method Blank Blank ID: MB for HBN 176 Blank Lab ID: 1412087	;8139 [XXX/38399]	Matrix	k: Water (Surfa	ce, Eff., Ground)
QC for Samples: 1178345001, 1178345002, 1	178345003, 1178345004, 1178	345005		
Results by AK102				
<u>Parameter</u> Diesel Range Organics	<u>Results</u> 0.300U	<u>LOQ/CL</u> 0.600	<u>DL</u> 0.180	<u>Units</u> mg/L
<b>Surrogates</b> 5a Androstane (surr)	82.6	60-120		%
Batch Information				
Analytical Batch: XFC13 Analytical Method: AK10 Instrument: HP 7890A Analyst: KMD	2	Prep Me Prep Da Prep Init	tch: XXX38399 ethod: SW35200 te/Time: 9/12/2 tial Wt./Vol.: 250 tract Vol: 1 mL	C 017 8:10:50AM



Blank Spike ID: LCS for HBN 1178345 [XXX38399] Blank Spike Lab ID: 1412088 Date Analyzed: 09/14/2017 22:09 Spike Duplicate ID: LCSD for HBN 1178345 [XXX38399] Spike Duplicate Lab ID: 1412089 Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1178345001, 1178345002, 1178345003, 1178345004, 1178345005

		Blank Spike	e (mg/L)	5	Spike Duplie	cate (mg/L)			
Parameter	<u>Spike</u>	Result	Rec (%)	<u>Spike</u>	Result	<u>Rec (%)</u>	CL	<u>RPD (%)</u>	RPD CL
Diesel Range Organics	20	19.0	95	20	19.6	98	(75-125)	3.00	(< 20 )
Surrogates									
5a Androstane (surr)	0.4	97.8	98	0.4	101	101	(60-120)	2.80	
Batch Information Analytical Batch: XFC13797 Analytical Method: AK102 Instrument: HP 7890A Analyst: KMD	, FID SV E F			Pre Pre Spil	ke Init Wt./\	<b>SW3520C</b> e: <b>09/12/201</b> /ol.: 20 mg/l	7 08:10 - Extract Vo		

Print Date: 09/15/2017 2:15:33PM

Project No.:     Z-393.CB(1     Project Name:     FAL:     Contact Name:       NPDI. No.:     Chris Fell     Phone Number:     FAL:     Contact Name:       Reports To:     Chris Fell     Fmail:     Arm     Arm       Reports To:     Chris Fell     Fmail:     Arm       Resterved for     Resterved for     Resterved for     Arm       Phone     Sample Identification     LociD     Sampler       Iab use     Sample Identification     LociD     Sampler       OA - E     FAET I7 - ALW IS     ArW IR     CoF     P       OA - E     FAET I7 - ALW IS     MW IR     CoF     P       OA - E     FAET I7 - ALW IS     MW IR     CoF     P       OA - E     FAET I7 - ALW IS     MW IR     CoF     P       OA - E     FAET I7 - ALW IS     MW IR     CoF     P       OA - F     FAET I7 - ALW IS     MW IR     CoF     P       OA	R&M Consultants, Inc W Project Name: W Project Name: Phone Number: FHT ell FMT R&M Consultants, Inc NAU IS AWIS AWIS AWIS AWIS AWIS COF AWWIS COF AMWIS COF AWWIS COF AMWIS COF COF AMWIS COF COF COF AMWIS COF COF COF COF COF COF COF COF	PATE: Date: ,	Alternation Altern	CHAIN OF teal SGS-Ancho ator SGS-Ancho ator Active SGS5 907.646.9655 907.646.9655 11@rmconsult.com an@rmconsult.com ator Natr Add/yy) (hhmm) Matr Add/yy) (hhmm) (hhmm) (htor Add/yy) (h	IN OF CUS SGS-Anchorage SGSS-Anchorage SGSS SGS-Anchorage SGSS SGS V SIS V SIS V SIS V SIS V SSS	O O O O O O O O O O O O O O O O O O O	×××××××××××××××××××××××××××××××××××××		177 (2017H) V/V/V/V/V/	Preservative/An	TS3345	I     of     I       Remarks     Remarks       SHEEU     SHEEU
J.	CURISTOPHERIO RU 9/2/17	n alta		Received By:	- n	1327	н-	01 <sup>21</sup> 191		STANDARD TAT, Level 2 PDF and SGS Access EDD	evel 2 PDF and So	GS Access EDD
N		ellf1p								Laboratory	Laboratory Check In Information	nation
Relinquished By (3):	1	Date:	-	Received By:			63			Temp Blank °C	Chain of C	Chain of Custody Seal (Circle):
		i								4%		Intact
Relinquished By (4):		516/60	01917 mg 10	Received For	Received For By Laboratory	¥ /				7.0		Broken





#### FAIRBANKS SAMPLE RECEIPT FORM

Note: This form is to be completed by Fairbanks Receiving Staff for all samples

Review Criteria:	C	onditi	on:	Comments/Actions Taken
Were custody seals intact? Note # & location, if applicable.	Yes	No	NA	Exemption permitted if sampler hand
COC accompanied samples?	Tes	No	N/A	carries/delivers.
Temperature blank compliant* (i.e., 0-6°C)	Nes	No		Exemption permitted if chilled &
If $>6^{\circ}C$ , were samples collected $<8$ hours ago?	Yes	No	N/A	collected <8hrs ago
If <0°C, were all sample containers ice free?	Yes	No	NHA	
Cooler ID:@4_& w/Therm. ID:2			5	
Cooler ID:@w/Therm. ID:				
Cooler ID:@w/Therm. ID:				
Cooler ID:@w/Therm. ID:				
Cooler ID:@w/Therm. ID:				
If samples are received without a temperature blank, the "cooler temperature" will be				
documented in lieu of the temperature blank and "COOLER TEMP" will be noted to the right. In cases where neither a temp blank nor cooler temp can be obtained, note				Note: Identify containers received at
ambient () or chilled (). Please check one.				non-compliant temperature. Use form
				FS-0029 if more space is needed.
Delivery Method: Chent (hand carried) Other:		king//		
		ee atta		
NEw second second state		Or N/		
→For samples received with payment, note amount (\$ ) and whe				cle one) was received.
Were samples in good condition (no leaks/cracks/breakage)?	(Yes,	No	N/A	Note: some samples are sent to
Packing material used (specify all that apply): Bubble Wrap				Anchorage without inspection by SGS Fairbanks personnel.
Separate plastic bags Vermiculite Other:				r arvanks personnel.
Were Trip Blanks (i.e., VOAs, LL-Hg) in cooler with samples?	Tes	NI-	NT/A	
For RUSH/SHORT Hold Time, were COC/Bottles flagged		No	N/A	
accordingly? Was Rush/Short HT email sent, if applicable?	Yes	No	(N/A)	
decordingly. Was Residential sent, il applicable?	Yes	No	N/A)	
Additional notes (if applicable):				L
71 00-014 7.65 				
				a
Des 510 # 2110 201				
Profile #: 342306				
Constantion of				
Note to Client: any "no" circled above indicates non-compliance	with standard	d proces	tures and ma	w impact data quality

000	e-Sam <u>r</u>	le Receipt	t Form						
SGS	SGS Workorder #:	1	178	345			7 8	3 4	5
Revi	ew Criteria	Condition (Yes,	No, N/A	I	Excep	tions No	ted belo	w	
Chain of	Custody / Temperature Requir	rements		N/A Exemption	on perm	itted if sam	pler hand c	arries/deliv	/ers.
	Were Custody Seals intact? Note # & I	ocation Yes	1-F						
	COC accompanied sa								
	N/A **Exemption permitted if o	chilled & colle							
		Yes	Cooler	_		@		Therm. ID:	
			Cooler	ID:		@		Therm. ID:	
Temperatur	e blank compliant* (i.e., 0-6 °C afte	r CF)?	Cooler	ID:		@	°C	Therm. ID:	
			Cooler	ID:		@	°C	Therm. ID:	
			Cooler	ID:		@	°C	Therm. ID:	
*lf >6°C	C, were samples collected <8 hours	ago? N/A							
1	f <0°C, were sample containers ice	free? N/A							
temperature" will be docu "COOLER TEMP" will be no	d <u>without</u> a temperature blank, the " imented in lieu of the temperature b oted to the right. In cases where ne r temp can be obtained, note "ambie "cl	lank & ither a							
	s received at non-compliant temper se form FS-0029 if more space is ne								
Holding Time / Do	cumentation / Sample Condition Re	quirements	Note: Re	efer to form F-08	83 "San	ple Guide"	for specific	holding ti	mes.
We	ere samples received within holding	time? Yes							
	** (i.e.,sample IDs,dates/times colle iffer <1hr, record details & login per								
	nambiguous? (i.e., method is specif analyses with >1 option for an								
				N/A ***Exemp	ption pe	rmitted for I	<u>metals (e.g.</u>	,200.8/602	0A).
Were proper containers	(type/mass/volume/preservative***)								
	<u>Volatile / LL-Hg Req</u>								
	e., VOAs, LL-Hg) in cooler with san	· _							
Were all water VOA vials	free of headspace (i.e., bubbles $\leq 6$	6mm)? Yes							
Were all so	oil VOAs field extracted with MeOH+	BFB? N/A							
Note to Client	t: Any "No", answer above indicates nor	n-compliance	with stan	dard procedure	s and m	ay impact o	data quality	<i>'</i> .	
	Additiona	l notes (if a	pplicab	le):					



#### **Sample Containers and Preservatives**

<u>Container Id</u>	Preservative	<u>Container</u> Condition	Container Id	<u>Preservative</u>	<u>Container</u> Condition
1178345001-A	HCL to $pH < 2$	ОК			
1178345001-B	HCL to $pH < 2$	ОК			
1178345001-C	HCL to $pH < 2$	ОК			
1178345001-D	HCL to $pH < 2$	ОК			
1178345001-E	HCL to $pH < 2$	ОК			
1178345002-A	HCL to $pH < 2$	ОК			
1178345002-B	HCL to $pH < 2$	ОК			
1178345002-C	HCL to $pH < 2$	ОК			
1178345002-D	HCL to $pH < 2$	ОК			
1178345002-E	HCL to $pH < 2$	ОК			
1178345003-A	HCL to $pH < 2$	ОК			
1178345003-B	HCL to $pH < 2$	OK			
1178345003-C	HCL to $pH < 2$	ОК			
1178345003-D	HCL to $pH < 2$	OK			
1178345003-E	HCL to $pH < 2$	OK			
1178345004-A	HCL to $pH < 2$	OK			
1178345004-B	HCL to $pH < 2$	OK			
1178345004-C	HCL to $pH < 2$	ОК			
1178345004-D	HCL to $pH < 2$	OK			
1178345004-E	HCL to $pH < 2$	OK			
1178345005-A	HCL to $pH < 2$	OK			
1178345005-B	HCL to $pH < 2$	ОК			
1178345005-C	HCL to $pH < 2$	OK			
1178345005-D	HCL to $pH < 2$	ОК			
1178345005-E	HCL to $pH < 2$	OK			
1178345006-A	HCL to $pH < 2$	ОК			
1178345006-B	HCL to $pH < 2$	ОК			
1178345006-C	HCL to $pH < 2$	ОК			

Container Condition Glossary

Containers for bacteriological, low level mercury and VOA vials are not opened prior to analysis and will be assigned condition code OK unless evidence indicates than an inappropriate container was submitted.

OK - The container was received at an acceptable pH for the analysis requested.

- BU The container was received with headspace greater than 6mm.
- DM- The container was received damaged.

FR- The container was received frozen and not usable for Bacteria or BOD analyses.

PA - The container was received outside of the acceptable pH for the analysis requested. Preservative was added upon receipt and the container is now at the correct pH. See the Sample Receipt Form for details on the amount and lot # of the preservative added.

PH - The container was received outside of the acceptable pH for the analysis requested. Preservative was added upon receipt, but was insufficient to bring the container to the correct pH for the analysis

requested. See the Sample Receipt Form for details on the amount and lot # of the preservative added.

## **APPENDIX F**

### **ADEC LABORATORY DATA REVIEW CHECKLIST**

#### Laboratory Data Review Checklist

#### Completed By:

Christopher D. Fell, CPG

Title:

Senior Geologist

Date:

10/13/2017

CS Report Name:

2017 Annual Monitoring Report: FAI - Hydrant Fuel System Site

Report Date:

October 2017

Consultant Firm:

R&M Consultants, Inc.

Laboratory Name:

SGS North America

Laboratory Report Number:

1178345

ADEC File Number:

100.38.128

Hazard Identification Number:

23140

#### 1178345

#### 1. Laboratory

a. Did an ADEC CS approved laboratory receive and perform all of the submitted sample analyses?

		Yes	O No	Comments:				
	SGS-A	nchorage	e					
	b. If the samples were transferred to another "network" laboratory or sub-contracted to an alternate laboratory, was the laboratory performing the analyses ADEC CS approved?							
		O Yes	O No	Comments:				
	Not ap	plicable						
2. <u>c</u>	<u>Chain of Custody (CoC)</u>							
	a. CoC information completed, signed, and dated (including released/received by)?							
		• Yes	O No	Comments:				
	See lev	See level 2 report						
	b. Co	rrect Ana	lyses requested?					
		• Yes	🔿 No	Comments:				
	See lev	vel 2 repo	ort					
3.	Laborator	Laboratory Sample Receipt Documentation						
	a. Sar	a. Sample/cooler temperature documented and within range at receipt ( $0^{\circ}$ to $6^{\circ}$ C)?						
		• Yes	O No	Comments:				
	1.2							
			ervation acceptable – acid orinated Solvents, etc.)?	lified waters, Methanol preserved VOC soil (GRO, BTEX,				
		• Yes	🔿 No	Comments:				
	See lev	See level 2 report						
	c. Sar	en, leaking (Methanol), zero headspace (VOC vials)?						
		• Yes	© No	Comments:				
	Sample	e conditio	on was documented as OK	for all samples submitted				
	L							

#### 1178345

d. If there were any discrepancies, were they documented? For example, incorrect sample containers/preservation, sample temperature outside of acceptable range, insufficient or missing samples, etc.?

	© Yes	🔿 No	Comments:					
	nented.							
	e. Data quality or usability affected?							
_	Comments: Data quality or usability were not affected.							
4.	Case Narrative	<u>e</u>						
	a. Present and	d understanda	ble?					
	• Yes	O No	Comments:					
	b. Discrepancies, errors, or QC failures identified by the lab?							
	Yes	© No	Comments:					
	01 (Samples FAI17-MW15 and FAI17-MW18) were recovered above QC							
	c. Were all corrective actions documented?							
	© Yes	No	Comments:					
	taken.							
	d. What is the effect on data quality/usability according to the case narrative?							
Comments:								
	The case narrative makes no statement on data quality or usability.							
5. <u>Sa</u>	mples Results							
	a. Correct analyses performed/reported as requested on COC?							
	• Yes	🔿 No	Comments:					
	b. All applicable holding times met?							
	Yes	O No	Comments:					

c. All soils reported on a dry weight basis?

O Yes O No Comments:

Not applicable (All samples are for groundwater)

d. Are the reported LOQs less than the Cleanup Level or the minimum required detection level for the project?

• Yes • No Comments:

e. Data quality or usability affected?

○ Yes ⊙ No Comments:

Data quality or usability were not affected.

6. QC Samples

a. Method Blank

i. One method blank reported per matrix, analysis and 20 samples?

• Yes • No

Comments:

ii. All method blank results less than limit of quantitation (LOQ)?

• Yes • No Comments:

iii. If above LOQ, what samples are affected?

Comments:

Not applicable

iv. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?

○ Yes ○ No Comments:

Not applicable

v. Data quality or usability affected?

Comments:

Data quality or usability were not affected.

- b. Laboratory Control Sample/Duplicate (LCS/LCSD)
  - i. Organics One LCS/LCSD reported per matrix, analysis and 20 samples? (LCS/LCSD required per AK methods, LCS required per SW846)

•	Yes	s 🔿 No	Comments:			
ii		etals/Inorganic samples?	es – one LCS and one sample duplicate reported per matrix, analysis and			
C	Yes	s 💿 No	Comments:			
Not appli	icable	e as no metals	/inorganic analyses were completed.			
ii	<ul> <li>iii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods: AK101 60%-120%, AK102 75%-125%, AK103 60%-120%; all other analyses see the laboratory QC pages)</li> </ul>					
•	Yes	s O No	Comments:			
iv	<ul> <li>iv. Precision – All relative percent differences (RPD) reported and less than method or laboratory limits? And project specified DQOs, if applicable. RPD reported from LCS/LCSD, MS/MSD, and or sample/sample duplicate. (AK Petroleum methods 20%; all other analyses see the laboratory QC pages)</li> </ul>					
•	Yes	s O No	Comments:			

v. If %R or RPD is outside of acceptable limits, what samples are affected?

Comments:

Not applicable

vi. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?

○ Yes ○ No Comments:

Not applicable

vii. Data quality or usability affected? (Use comment box to explain.)

Comments:

Data quality or usability were not affected.

- c. Surrogates Organics Only
  - i. Are surrogate recoveries reported for organic analyses field, QC and laboratory samples?

• Yes • No Comments:

ii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods 50-150 %R; all other analyses see the laboratory report pages)

○ Yes <sup>●</sup> No Comments:

4-bromofluorobenzene was recovered outside QC criteria (50 to 150 percent) at 269 and 157 percent for samples FAI17-MW15 and FAI17-MW18 due to matrix interference, respectively. GRO results for the affected samples are flagged MH to indicate the potential high bias.

iii. Do the sample results with failed surrogate recoveries have data flags? If so, are the data flags clearly defined?

Yes O No

Comments:

See above.

iv. Data quality or usability affected?

Comments:

Data quality and usability are affected as described in 6(c)(ii)

- d. Trip blank Volatile analyses only (GRO, BTEX, Volatile Chlorinated Solvents, etc.): Water and Soil
  - i. One trip blank reported per matrix, analysis and for each cooler containing volatile samples?

(If not, enter explanation below.)

• Yes • No Comments:

ii. Is the cooler used to transport the trip blank and VOA samples clearly indicated on the COC? (If not, a comment explaining why must be entered below)

• Yes O No	Comments:				
iii. All results less than LO	iii. All results less than LOQ?				
• Yes O No	Comments:				

#### 1178345

iv. If above LOQ, what samples are affected?

Comments:

# Not applicable v. Data quality or usability affected? Comments: Data quality or usability were not affected. e. Field Duplicate i. One field duplicate submitted per matrix, analysis and 10 project samples? • Yes<on No</td> Comments: FAI17-MW8R is the duplicate of FAI17-MW1R ii. Submitted blind to lab? • Yes<on No</td> Comments:

iii. Precision – All relative percent differences (RPD) less than specified DQOs? (Recommended: 30% water, 50% soil)

RPD (%) = Absolute value of: -

$$\frac{(R_1 - R_2)}{((R_1 + R_2)/2)} \times 100$$

Where  $R_1 =$  Sample Concentration  $R_2 =$  Field Duplicate Concentration

🔿 Yes 🛛 💿 No

Comments:

GRO failed the QC criteria with an RPD of 44%; however, both values were J flagged as estimated and elevated variance is expected for small J-flagged results. GRO data are QN flagged to indicate there may be an unknown bias.

iv. Data quality or usability affected? (Use the comment box to explain why or why not.)

Comments:

Data quality and usability are affected as described in 6(e)(iii)

f. Decontamination or Equipment Blank (If not applicable, a comment stating why must be entered below).

○ Yes ○ No ⊙ Not Applicable

No decontamination blank was collected.

- i. All results less than LOQ?
- Yes No Comments:

Not applicable

ii. If above LOQ, what samples are affected?

Comments:

Not applicable

iii. Data quality or usability affected?

Comments:

Not applicable

#### 7. Other Data Flags/Qualifiers (ACOE, AFCEE, Lab Specific, etc.)

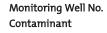
a. Defined and appropriate?

• Yes • No

Comments:

GRO results for MW-15 and MW-18 are flagged MH due to a high bias from surrogate recovery failure. Affects to data quality and usability are discussed above. GRO results are conservatively flagged QN due to a possible unknown bias from the primary-duplicate RPD failure, but it should be noted that the GRO results compared for RPD calculations were both J-flagged and are considered estimated.

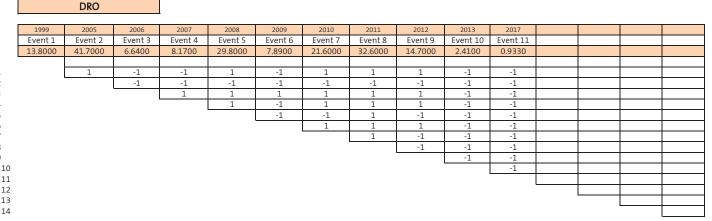
## APPENDIX G Mann Kendall Analysis

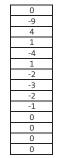


Monitoring Date:

Concentration (mg/L)

Row 1: Compare to Event 1 Row 2: Compare to Event 2 Row 3: Compare to Event 3 Row 4: Compare to Event 4 Row 5: Compare to Event 5 Row 6: Compare to Event 7 Row 8: Compare to Event 7 Row 8: Compare to Event 9 Row 10: Compare to Event 10 Row 11: Compare to Event 11 Row 12: Compare to Event 113 Row 14: Compare to Event 13 Row 14: Compare to Event 13





Mann-Kendall Statistic (S) = Total Number of Events (n) Groups of Ties / Ties Per Group Variance of S (σ(S)) Z Statisic Z Statisic at α=0.05 or 95% Confidence Level Approximate Actual Confidence Level of Z Statistic Coefficient of Variance (CV)



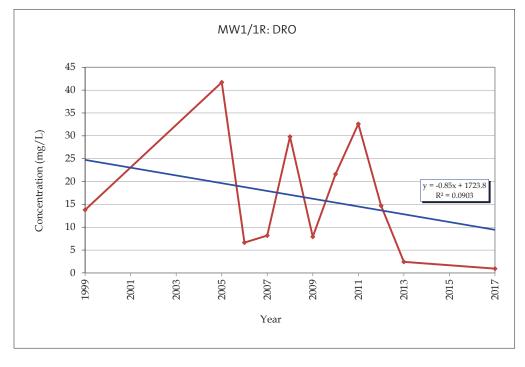
Trend Analysis								
Statistical Method	Result							
Linear Regression	Possible Decreasing Trend							
Mann-Kendall	Decreasing Trend							

Notes:

A minimum of four (4) independent sampling events are required for the Mann-Kendall test to be valid.
 Non-detects are listed as 1/2 the value of the laboratory detection limit

- A negative S value with confidence > 90% and < 95% indicates a probable decreasing concentration trend. - A negative S value with confidence > 95% indicates a decreasing concentration trend.

- A positive S value with confidence > 90% and < 95% indicates a probable increasing concentration trend.
- A positive S value with confidence > 95% indicates an increasing concentration trend.
- A positive S value with confidence < 90% indicates that there is likely no concentration trend.
- A negative S value with confidence < 90% and CV > 1 indicates that there is likely no concentration trend.
- A negative S value with confidence < 90% and CV < 1 indicates a stable concentration trend.
- The closer to zero the CV is, the less variation in concentrations between sampling events.
- $R^2$  is calculated without testing the approximate normality of the data. Additionally, if sample size is < 8, the power of the linear regression is low.
- R<sup>2</sup> values between 0.5 and 0.8 indicate possible correlation, suggesting that there is possibly a trend.
- R<sup>2</sup> values greater than 0.8 indicate a correlation, suggesting that there is likely a trend.
- Effects of Coefficient of Variation based on Table 3.2 (AFCEE, 2000)



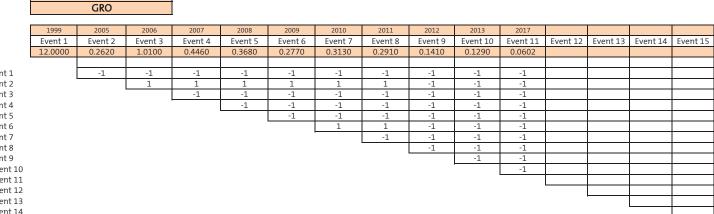
MW-1/1R



Monitoring Date:

Concentration (mg/L)

Row 1: Compare to Event 1 Row 2: Compare to Event 2 Row 3: Compare to Event 3 Row 4: Compare to Event 4 Row 5: Compare to Event 5 Row 6: Compare to Event 7 Row 8: Compare to Event 7 Row 8: Compare to Event 7 Row 9: Compare to Event 9 Row 10: Compare to Event 10 Row 11: Compare to Event 11 Row 12: Compare to Event 11 Row 13: Compare to Event 113 Row 14: Compare to Event 13





Mann-Kendall Statistic (S) = Total Number of Events (n) Groups of Ties / Ties Per Group Variance of S (σ(S)) Z Statisic Z Statisic at α=0.05 or 95% Confidence Level Approximate Actual Confidence Level of Z Statistic Coefficient of Variance (CV)

÷	
	-39
	11
	0
	11.31371
	3.358757
	1.645
	>99.9%
	2.54

Trend Analysis									
Statistical Method	Result								
Linear Regression	Possible Decreasing Trend								
Mann-Kendall	Decreasing Trend								

Notes:

A minimum of four (4) independent sampling events are required for the Mann-Kendall test to be valid.
 Non-detects are listed as 1/2 the value of the laboratory detection limit

- A negative S value with confidence > 90% and < 95% indicates a probable decreasing concentration trend.

- A negative S value with confidence > 95% indicates a decreasing concentration trend.
- A positive S value with confidence > 90% and < 95% indicates a probable increasing concentration trend.
- A positive S value with confidence > 95% indicates an increasing concentration trend.
- A positive S value with confidence < 90% indicates that there is likely no concentration trend.
- A negative S value with confidence < 90% and CV > 1 indicates that there is likely no concentration trend.
   A negative S value with confidence < 90% and CV < 1 indicates a stable concentration trend.</li>
- The closer to zero the CV is, the less variation in concentrations between sampling events.
- R<sup>2</sup> is calculated without testing the approximate normality of the data. Additionally, if sample size is < 8, the
  power of the linear regression is low.</li>
- $R^2$  values between 0.5 and 0.8 indicate possible correlation, suggesting that there is possibly a trend.
- R<sup>2</sup> values greater than 0.8 indicate a correlation, suggesting that there is likely a trend.
- Effects of Coefficient of Variation based on Table 3.2 (AFCEE, 2000)



MW-1/1R

2009

-1

-1

-1

0

0

0

0

2010

Event 9

0.00025

-1

-1

-1

0

0

0

0

0

2011

Event 10

0.00025

-1

-1

-1

0

0

0

0

0

0

2012

Event 11

0.1500

1

1

1

1

1

1

1

1

1

1

2013

Event 12

0.000125

-1

-1

-1

-1

-1

2017

0.000250

-1

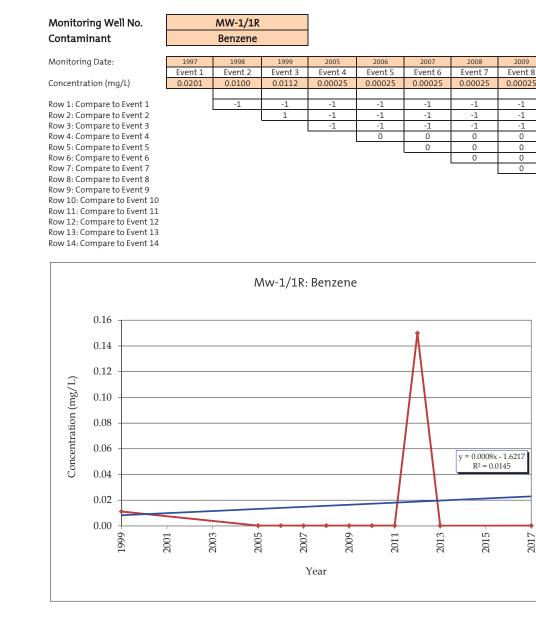
-1

-1

0

0

Event 13 Event 14 Event 15



-1 0 -1 0 -1 0 -1 0 -1 0 -1 -1 1 Mann-Kendall Statistic (S) = Total Number of Events (n) Groups of Ties / Ties Per Group Variance of S ( $\sigma$ (S))

Z Statisic Z Statisic at α=0.05 or 95% Confidence Level Approximate Actual Confidence Level of Z Statistic Coefficient of Variance (CV)

0
0
-26
13
1/8
15.2206
1.6425108
1.645
95.0%
2.76

-10

-7

-8

0

0

0

0

0

0

0

-2

1

Trend Analysis								
Statistical Method	Result							
Linear Regression	Indeterminate Trend							
Mann-Kendall	Probable Decreasing Trend							

#### Notes:

- A minimum of four (4) independent sampling events are required for the Mann-Kendall test to be valid. - Non-detects are listed as 1/2 the value of the laboratory detection limit

- A negative S value with confidence > 90% and < 95% indicates a probable decreasing concentration trend. - A negative S value with confidence > 95% indicates a decreasing concentration trend.

- A positive S value with confidence > 90% and < 95% indicates a probable increasing concentration trend.

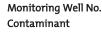
- A positive S value with confidence > 95% indicates an increasing concentration trend.
- A positive S value with confidence < 90% indicates that there is likely no concentration trend.
- A negative S value with confidence < 90% and CV > 1 indicates that there is likely no concentration trend.
- A negative S value with confidence < 90% and CV < 1 indicates a stable concentration trend. - The closer to zero the CV is, the less variation in concentrations between sampling events.

-  $R^2$  is calculated without testing the approximate normality of the data. Additionally, if sample size is < 8, the power of the linear regression is low.

- R<sup>2</sup> values between 0.5 and 0.8 indicate possible correlation, suggesting that there is possibly a trend. - R<sup>2</sup> values greater than 0.8 indicate a correlation, suggesting that there is likely a trend.

- Effects of Coefficient of Variation based on Table 3.2 (AFCEE, 2000)

2017



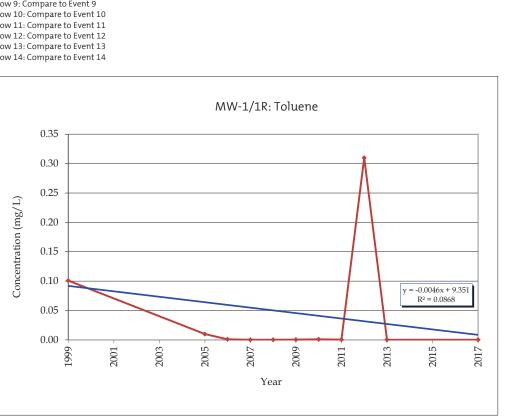
MW-1/1R

Toluene

Monitoring Date:

Concentration (mg/L)

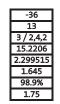
Row 1: Compare to Event 1 Row 2: Compare to Event 2 Row 3: Compare to Event 3 Row 4: Compare to Event 4 Row 5: Compare to Event 5 Row 6: Compare to Event 7 Row 8: Compare to Event 7 Row 9: Compare to Event 8 Row 9: Compare to Event 8 Row 10: Compare to Event 10 Row 11: Compare to Event 11 Row 12: Compare to Event 12 Row 13: Compare to Event 13 Row 14: Compare to Event 13



1997	1998	1999	2005	2006	2007	2008	2009	2010	2011	2012	2013	2017		
Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15
0.16300	0.12100	0.10100	0.01000	0.00100	0.00025	0.00025	0.00050	0.00100	0.00050	0.31000	0.00025	0.00025		
	-1	-1	-1	-1	-1	-1	-1	-1	-1	1	-1	-1		
		-1	-1	-1	-1	-1	-1	-1	-1	1	-1	-1		
			-1	-1	-1	-1	-1	-1	-1	1	-1	-1		
				-1	-1	-1	-1	-1	-1	1	-1	-1		
					-1	-1	-1	0	-1	1	-1	-1		
						0	1	1	1	1	0	0		
							1	1	1	1	0	0		
								1	0	1	-1	-1		
									-1	1	-1	-1		
										1	-1	-1		
											-1	-1		
												0		



Mann-Kendall Statistic (S) = Total Number of Events (n) Groups of Ties / Ties Per Group Variance of S (σ(S)) Z Statisic Z Statisic at α=0.05 or 95% Confidence Level Approximate Actual Confidence Level of Z Statistic Coefficient of Variance (CV)



Trend Analysis									
Statistical Method	Result								
Linear Regression	Decreasing Trend								
Mann-Kendall	Decreasing Trend								

Notes:

A minimum of four (4) independent sampling events are required for the Mann-Kendall test to be valid.
 Non-detects are listed as 1/2 the value of the laboratory detection limit

A negative S value with confidence > 90% and < 95% indicates a probable decreasing concentration trend.</li>
 A negative S value with confidence > 95% indicates a decreasing concentration trend.

- A positive S value with confidence > 90% and < 95% indicates a probable increasing concentration trend.

- A positive S value with confidence > 95% indicates an increasing concentration trend.

- A positive S value with confidence < 90% indicates that there is likely no concentration trend.

- A negative S value with confidence < 90% and CV > 1 indicates that there is likely no concentration trend.

- A negative S value with confidence < 90% and CV < 1 indicates a stable concentration trend.

- The closer to zero the CV is, the less variation in concentrations between sampling events.

-  $R^2$  is calculated without testing the approximate normality of the data. Additionally, if sample size is < 8, the power of the linear regression is low.

-  $R^2$  values between 0.5 and 0.8 indicate possible correlation, suggesting that there is possibly a trend.

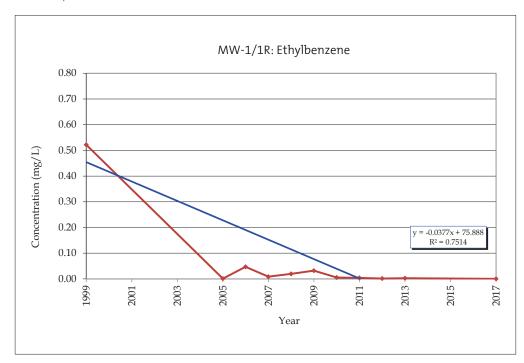
- R<sup>2</sup> values greater than 0.8 indicate a correlation, suggesting that there is likely a trend.

# Monitoring Well No. Contaminant

Monitoring Date:

Concentration (mg/L)

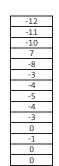
Row 1: Compare to Event 1 Row 2: Compare to Event 2 Row 3: Compare to Event 3 Row 4: Compare to Event 4 Row 5: Compare to Event 5 Row 6: Compare to Event 7 Row 8: Compare to Event 7 Row 8: Compare to Event 9 Row 10: Compare to Event 10 Row 11: Compare to Event 11 Row 12: Compare to Event 11 Row 13: Compare to Event 11 Row 13: Compare to Event 11 Row 13: Compare to Event 11 Row 14: Compare to Event 13



MW-1/1R

Ethylbenzene

1007	1000	1000	2005	2000	2007	2000	2000	2010	2011	2012	2012	2017		1
1997	1998	1999	2005	2006	2007	2008	2009	2010	2011	2012	2013	2017		
Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15
0.6960	0.6050	0.5220	0.0010	0.0470	0.0087	0.0198	0.0320	0.0055	0.00377	0.00163	0.00251	0.00025		
	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1		
		-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1		
			-1	-1	-1	-1	-1	-1	-1	-1	-1	-1		
				1	1	1	1	1	1	1	1	-1		
					-1	-1	-1	-1	-1	-1	-1	-1		
						1	1	-1	-1	-1	-1	-1		
							1	-1	-1	-1	-1	-1		
								-1	-1	-1	-1	-1		
								-	-1	-1	-1	-1		
										-1	-1	-1		
											1	-1		
												-1		



Mann-Kendall Statistic (S) = Total Number of Events (n) Groups of Ties / Ties Per Group Variance of S (σ(S)) Z Statisic Z Statisic at α=0.05 or 95% Confidence Level Approximate Actual Confidence Level of Z Statistic Coefficient of Variance (CV)

1	-54	
	13	
	0	
	15.2206	
	3.482123	
	1.645	
	>99.9%	
	1.76	

Trend Analysis									
Statistical Method	Result								
Linear Regression	Possible Decreasing Trend								
Mann-Kendall	Decreasing Trend								

#### Notes:

A minimum of four (4) independent sampling events are required for the Mann-Kendall test to be valid.
 Non-detects are listed as 1/2 the value of the laboratory detection limit

A negative S value with confidence > 90% and < 95% indicates a probable decreasing concentration trend.</li>
 A negative S value with confidence > 95% indicates a decreasing concentration trend.

- A positive S value with confidence > 90% and < 95% indicates a probable increasing concentration trend.

- A positive S value with confidence > 95% indicates an increasing concentration trend.

- A positive S value with confidence < 90% indicates that there is likely no concentration trend.

- A negative S value with confidence < 90% and CV > 1 indicates that there is likely no concentration trend.

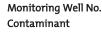
- A negative S value with confidence < 90% and CV < 1 indicates a stable concentration trend.</li>
 - The closer to zero the CV is, the less variation in concentrations between sampling events.

The closer to zero the cly is, the less variation in concentrations between sampling events

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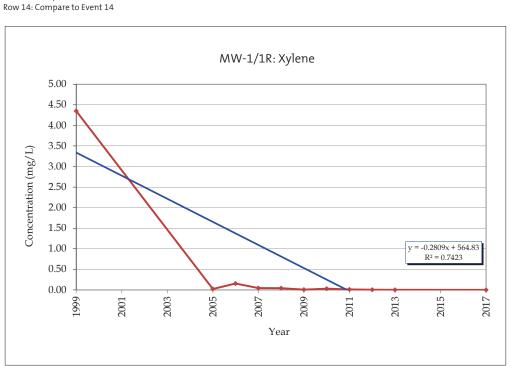
- R<sup>2</sup> values greater than 0.8 indicate a correlation, suggesting that there is likely a trend.



Monitoring Date:

Concentration (mg/L)

Row 1: Compare to Event 1 Row 2: Compare to Event 2 Row 3: Compare to Event 3 Row 4: Compare to Event 4 Row 5: Compare to Event 5 Row 6: Compare to Event 7 Row 8: Compare to Event 7 Row 8: Compare to Event 7 Row 9: Compare to Event 8 Row 9: Compare to Event 10 Row 11: Compare to Event 11 Row 12: Compare to Event 12 Row 13: Compare to Event 13 Row 14: Compare to Event 13



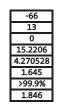
MW-1/1R

**Xylene** 

1997	1998	1999	2005	2006	2007	2008	2009	2010	2011	2012	2013	2017		
Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15
4.7500	4.5000	4.3500	0.02297	0.1550	0.0449	0.0433	0.00626	0.0294	0.0112	0.00357	0.00237	0.00025		
	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1		
-		-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1		
			-1	-1	-1	-1	-1	-1	-1	-1	-1	-1		
				1	1	1	-1	1	-1	-1	-1	-1		
					-1	-1	-1	-1	-1	-1	-1	-1		
						-1	-1	-1	-1	-1	-1	-1		
							-1	-1	-1	-1	-1	-1		
								1	1	-1	-1	-1		
									-1	-1	-1	-1		
									-	-1	-1	-1		
											-1	-1		
												-1		
												-		



Mann-Kendall Statistic (S) = Total Number of Events (n) Groups of Ties / Ties Per Group Variance of S (σ(S)) Z Statisic Z Statisic at α=0.05 or 95% Confidence Level Approximate Actual Confidence Level of Z Statistic Coefficient of Variance (CV)



Trend Analysis								
Statistical Method	Result							
Linear Regression	Possible Decreasing Trend							
Mann-Kendall	Decreasing Trend							

#### Notes:

A minimum of four (4) independent sampling events are required for the Mann-Kendall test to be valid.
 Non-detects are listed as 1/2 the value of the laboratory detection limit

A negative S value with confidence > 90% and < 95% indicates a probable decreasing concentration trend.</li>
 A negative S value with confidence > 95% indicates a decreasing concentration trend.

- A positive S value with confidence > 90% and < 95% indicates a probable increasing concentration trend.

- A positive S value with confidence > 95% indicates an increasing concentration trend.
- A positive S value with confidence < 90% indicates that there is likely no concentration trend.
- A negative S value with confidence < 90% and CV > 1 indicates that there is likely no concentration trend.
- A negative S value with confidence < 90% and CV < 1 indicates a stable concentration trend.
- The closer to zero the CV is, the less variation in concentrations between sampling events.
- $R^2$  is calculated without testing the approximate normality of the data. Additionally, if sample size is < 8, the power of the linear regression is low.
- $R^2$  values between 0.5 and 0.8 indicate possible correlation, suggesting that there is possibly a trend.
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- Effects of Coefficient of Variation based on Table 3.2 (AFCEE, 2000)

2008

Event 9

5.5300

1

1

1

2009

Event 10

2.2300

1

-1

1

2010

Event 11

2.4700

1

-1

1

1

1

1

1

-1

-1

1

2011

Event 12

5.6700

1

1

1

1

1

1

1

1

1

1

1

2012

Event 13

1.6800

1

-1

1

1

1

1

1

-1

-1

-1

-1

-1

2013

Event 14

1.5200

2007

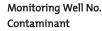
Event 8

2.9100

1

1

1



MW-15

DRO

2001

Event 2

2.5600

1

2002

Event 3

1.5600

-1

-1

2003

Event 4

1.2700

-1

-1

-1

2004

Event 5

0.8100

-1

-1

-1

2005

Event 6

0.4430

-1

-1

-1

2006

Event 7

1.4200

-1

-1

-1

1999

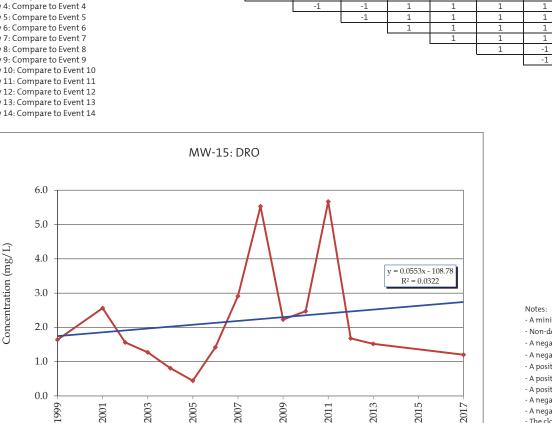
Event 1

1.6400

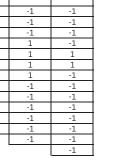
Monitoring Date:

Concentration (mg/L)

Row 1: Compare to Event 1 Row 2: Compare to Event 2 Row 3: Compare to Event 3 Row 4: Compare to Event 4 Row 5: Compare to Event 5 Row 6: Compare to Event 6 Row 7: Compare to Event 7 Row 8: Compare to Event 8 Row 9: Compare to Event 9 Row 10: Compare to Event 10 Row 11: Compare to Event 11 Row 12: Compare to Event 12 Row 13: Compare to Event 13 Row 14: Compare to Event 14



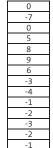
Year



2017

Event 15

1.2000



Mann-Kendall Statistic (S) = Total Number of Events (n) Groups of Ties / Ties Per Group Variance of S ( $\sigma$ (S)) Z Statisic Z Statisic at α=0.05 or 95% Confidence Level Approxoimate Actual Confidence Level of Z Statistic Coefficient of Variance (CV)

1	5	l
	15	
	0	
	19.27001	
	0.207576	
	1.645	
	58.2%	
	0.697	

Trend Analysis							
Statistical Method	Result						
Linear Regression	Indeterminate Trend						
Mann-Kendall	Likley No Trend						

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- A positive S value with confidence > 95% indicates an increasing concentration trend.

- A positive S value with confidence < 90% indicates that there is likely no concentration trend.

- A negative S value with confidence < 90% and CV > 1 indicates that there is likely no concentration trend.

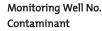
- A negative S value with confidence < 90% and CV < 1 indicates a stable concentration trend.

- The closer to zero the CV is, the less variation in concentrations between sampling events.

- R<sup>2</sup> is calculated without testing the approximate normality of the data. Additionally, if sample size is < 8, the power of the linear regression is low.

- R<sup>2</sup> values between 0.5 and 0.8 indicate possible correlation, suggesting that there is possibly a trend.

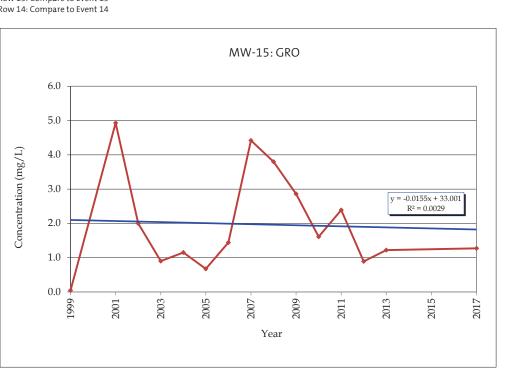
- R<sup>2</sup> values greater than 0.8 indicate a correlation, suggesting that there is likely a trend.



Monitoring Date:

Concentration (mg/L)

Row 1: Compare to Event 1 Row 2: Compare to Event 2 Row 3: Compare to Event 3 Row 4: Compare to Event 4 Row 5: Compare to Event 5 Row 6: Compare to Event 7 Row 8: Compare to Event 7 Row 8: Compare to Event 9 Row 10: Compare to Event 10 Row 11: Compare to Event 11 Row 12: Compare to Event 11 Row 13: Compare to Event 11 Row 13: Compare to Event 11 Row 14: Compare to Event 13 Row 14: Compare to Event 13



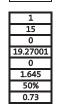
MW-15

GRO

1999	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2017
Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15
0.0450	4.9300	2.0000	0.9000	1.1500	0.6740	1.4400	4.4200	3.8000	2.8600	1.6100	2.3900	0.8900	1.2200	1.2700
	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
			-1	-1	-1	-1	1	1	1	-1	1	-1	-1	-1
				1	-1	1	1	1	1	1	1	-1	1	1
					-1	1	1	1	1	1	1	-1	1	1
						1	1	1	1	1	1	1	1	1
							1	1	1	1	1	-1	-1	-1
								-1	-1	-1	-1	-1	-1	-1
									-1	-1	-1	-1	-1	-1
										-1	-1	-1	-1	-1
											1	-1	-1	-1
												-1	-1	-1
													1	1
														1

14
-13
-4
7
6
9
6 9 2
-7
-6
-5
-2
-3
2
1

Mann-Kendall Statistic (S) = Total Number of Events (n) Groups of Ties / Ties Per Group Variance of S (σ(S)) Z Statisic Z Statisic at α=0.05 or 95% Confidence Level Approxoimate Actual Confidence Level of Z Statistic Coefficient of Variance (CV)



Trend Analysis								
Statistical Method	Result							
Linear Regression	Likely No Trend							
Mann-Kendall	Indeterminate Trend							

Notes:

A minimum of four (4) independent sampling events are required for the Mann-Kendall test to be valid.
 Non-detects are listed as 1/2 the value of the laboratory detection limit

- A negative S value with confidence > 90% and < 95% indicates a probable decreasing concentration trend. - A negative S value with confidence > 95% indicates a decreasing concentration trend.

- A positive S value with confidence > 90% and < 95% indicates a probable increasing concentration trend.

- A positive S value with confidence > 95% indicates an increasing concentration trend.
- A positive S value with confidence < 90% indicates that there is likely no concentration trend.

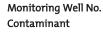
- A negative S value with confidence < 90% and CV > 1 indicates that there is likely no concentration trend.

- A negative S value with confidence < 90% and CV < 1 indicates a stable concentration trend.
- The closer to zero the CV is, the less variation in concentrations between sampling events.

-  $R^2$  is calculated without testing the approximate normality of the data. Additionally, if sample size is < 8, the power of the linear regression is low.

- R<sup>2</sup> values between 0.5 and 0.8 indicate possible correlation, suggesting that there is possibly a trend.

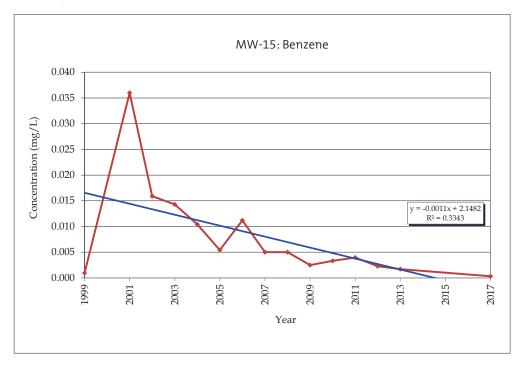
- R<sup>2</sup> values greater than 0.8 indicate a correlation, suggesting that there is likely a trend.



Monitoring Date:

Concentration (mg/L)

Row 1: Compare to Event 1 Row 2: Compare to Event 2 Row 3: Compare to Event 3 Row 4: Compare to Event 4 Row 5: Compare to Event 5 Row 6: Compare to Event 7 Row 8: Compare to Event 7 Row 8: Compare to Event 7 Row 9: Compare to Event 9 Row 10: Compare to Event 10 Row 11: Compare to Event 11 Row 12: Compare to Event 113 Row 14: Compare to Event 13



MW-15

Benzene

1999	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2017
Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15
0.000949	0.036000	0.015900	0.014300	0.010400	0.005420	0.011200	0.005000	0.005000	0.002500	0.003310	0.003970	0.002270	0.001710	0.000320
	1	1	1	1	1	1	1	1	1	1	1	1	1	-1
		-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
			-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
				-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
					-1	1	-1	-1	-1	-1	-1	-1	-1	-1
						1	-1	-1	-1	-1	-1	-1	-1	-1
							-1	-1	-1	-1	-1	-1	-1	-1
								0	-1	-1	-1	-1	-1	-1
									-1	-1	-1	-1	-1	-1
										1	1	-1	-1	-1
											1	-1	-1	-1
												-1	-1	-1
													-1	-1
														-1

12	
-13	
-12	
-11	
-8	
-7	
-8	
-6 -6	
-1	
-2	
-3 -2	
-1	

Mann-Kendall Statistic (S) = Total Number of Events (n) Groups of Ties / Ties Per Group Variance of S (o(S)) Z Statisic Z Statisic at α=0.05 or 95% Confidence Level Approxoimate Actual Confidence Level of Z Statistic Coefficient of Variance (CV)

1		i
	-68	
	15	
	1/2	
	19.27001	
	3.476905	
	1.645	
	>99.9%	
	1.16	

Trend Analysis								
Statistical Method	Result							
Linear Regression	Likely Decreasing Trend							
Mann-Kendall	Decreasing Trend							

#### Notes:

A minimum of four (4) independent sampling events are required for the Mann-Kendall test to be valid.
 Non-detects are listed as 1/2 the value of the laboratory detection limit

A negative S value with confidence > 90% and < 95% indicates a probable decreasing concentration trend.</li>
 A negative S value with confidence > 95% indicates a decreasing concentration trend.

- A positive S value with confidence > 90% and < 95% indicates a probable increasing concentration trend.

- A positive S value with confidence > 95% indicates an increasing concentration trend.

- A positive S value with confidence < 90% indicates that there is likely no concentration trend.

- A negative S value with confidence < 90% and CV > 1 indicates that there is likely no concentration trend.

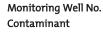
- A negative S value with confidence < 90% and CV < 1 indicates a stable concentration trend.

- The closer to zero the CV is, the less variation in concentrations between sampling events.

- R<sup>2</sup> is calculated without testing the approximate normality of the data. Additionally, if sample size is < 8, the power of the linear regression is low.

- R<sup>2</sup> values between 0.5 and 0.8 indicate possible correlation, suggesting that there is possibly a trend.

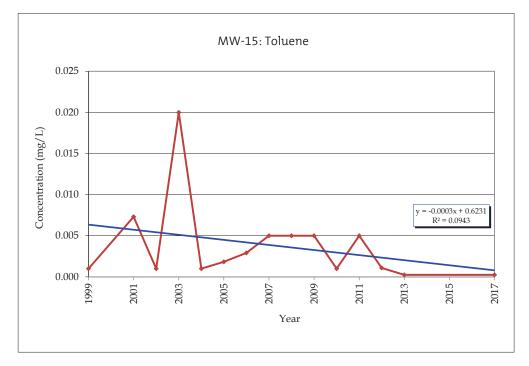
- R<sup>2</sup> values greater than 0.8 indicate a correlation, suggesting that there is likely a trend.



Monitoring Date:

Concentration (mg/L)

Row 1: Compare to Event 1 Row 2: Compare to Event 2 Row 3: Compare to Event 3 Row 4: Compare to Event 4 Row 5: Compare to Event 5 Row 6: Compare to Event 7 Row 8: Compare to Event 7 Row 8: Compare to Event 9 Row 10: Compare to Event 10 Row 11: Compare to Event 11 Row 12: Compare to Event 12 Row 13: Compare to Event 14



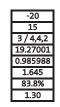
MW-15

Toluene

			-											
1999	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2017
Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15
0.00100	0.00731	0.00100	0.02000	0.00100	0.00183	0.00292	0.00500	0.00500	0.00500	0.00100	0.00500	0.00109	0.00025	0.00025
	1	0	1	0	1	1	1	1	1	0	1	1	-1	-1
		-1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
			1	0	1	1	1	1	1	0	1	1	-1	-1
				-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
					1	1	1	1	1	0	1	1	-1	-1
						1	1	1	1	-1	1	-1	-1	-1
							1	1	1	-1	1	-1	-1	-1
								0	0	-1	0	-1	-1	-1
									0	-1	0	-1	-1	-1
										-1	0	-1	-1	-1
											1	1	-1	-1
												-1	-1	-1
													-1	-1
														0



Mann-Kendall Statistic (S) = Total Number of Events (n) Groups of Ties / Ties Per Group Variance of S (σ(S)) Z Statisic Z Statisic at α=0.05 or 95% Confidence Level Approximate Actual Confidence Level of Z Statistic Coefficient of Variance (CV)



Trend Analysis							
Statistical Method	Result						
Linear Regression	Indeterminate Trend						
Mann-Kendall	Likely No Trend						

Notes:

A minimum of four (4) independent sampling events are required for the Mann-Kendall test to be valid.
 Non-detects are listed as 1/2 the value of the laboratory detection limit

A negative S value with confidence > 90% and < 95% indicates a probable decreasing concentration trend.</li>
 A negative S value with confidence > 95% indicates a decreasing concentration trend.

- A positive S value with confidence > 90% and < 95% indicates a probable increasing concentration trend.

- A positive S value with confidence > 95% indicates an increasing concentration trend.

- A positive S value with confidence < 90% indicates that there is likely no concentration trend.

- A negative S value with confidence < 90% and CV > 1 indicates that there is likely no concentration trend.

- A negative S value with confidence < 90% and CV < 1 indicates a stable concentration trend.

 $\mbox{-}$  The closer to zero the CV is, the less variation in concentrations between sampling events.

- R<sup>2</sup> is calculated without testing the approximate normality of the data. Additionally, if sample size is < 8, the power of the linear regression is low.

- R<sup>2</sup> values between 0.5 and 0.8 indicate possible correlation, suggesting that there is possibly a trend.

- R<sup>2</sup> values greater than 0.8 indicate a correlation, suggesting that there is likely a trend.

2008

Event 9

2009

Event 10

2010

Event 11

2011

Event 12

2012

Event 13

0.0654

1

-1

-1

-1

-1

-1

-1

-1

-1

-1

-1

-1

2013

Event 14

0.0664

1

-1

-1

-1

-1

-1

-1

-1

-1

-1

-1

-1

1

2017

Event 15

0.0615

1

-1

-1

-1

-1

-1

-1

-1

-1

-1

-1

-1

-1

-1

2007

Event 8

# Monitoring Well No. Contaminant

MW-15

Ethylbenzene

2001

Event 2

2002

Event 3

2003

Event 4

2004

Event 5

2005

Event 6

2006

Event 7

v = -0.0048x + 9.716 $R^2 = 0.0922$ 

2015

2013

2011

1999

Event 1

Monitoring Date:

Concentration (mg/L)

Row 1: Compare to Event 1 Row 2: Compare to Event 2 Row 3: Compare to Event 3 Row 4: Compare to Event 4 Row 5: Compare to Event 5 Row 6: Compare to Event 6 Row 7: Compare to Event 7 Row 8: Compare to Event 8 Row 9: Compare to Event 9 Row 10: Compare to Event 10 Row 11: Compare to Event 11 Row 12: Compare to Event 12 Row 13: Compare to Event 13 Row 14: Compare to Event 14

Concentration (mg/L)

0.20

0.15

0.10

0.05

0.00

999

2001

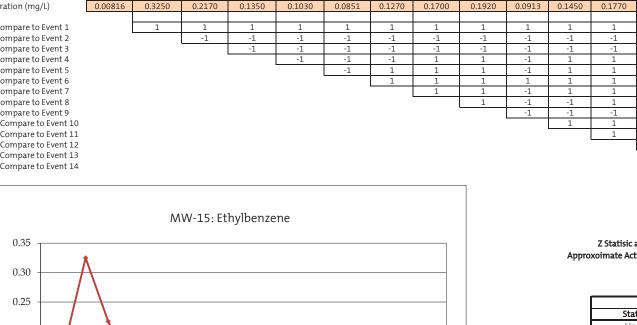
2003

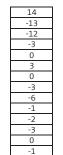
2005

2007

Year

2009





Mann-Kendall Statistic (S) = Total Number of Events (n) Groups of Ties / Ties Per Group Variance of S ( $\sigma$ (S)) Z Statisic Z Statisic at α=0.05 or 95% Confidence Level Approxoimate Actual Confidence Level of Z Statistic Coefficient of Variance (CV)

-27
15
0
19.27001
1.349247
1.645
91.1%
0.60

Trend Analysis						
Statistical Method	Result					
Linear Regression	Likely No Trend					
Mann-Kendall	Probably Decreasing Trend					

Notes:

- A minimum of four (4) independent sampling events are required for the Mann-Kendall test to be valid. - Non-detects are listed as 1/2 the value of the laboratory detection limit

- A negative S value with confidence > 90% and < 95% indicates a probable decreasing concentration trend. - A negative S value with confidence > 95% indicates a decreasing concentration trend.

- A positive S value with confidence > 90% and < 95% indicates a probable increasing concentration trend.

- A positive S value with confidence > 95% indicates an increasing concentration trend.

- A positive S value with confidence < 90% indicates that there is likely no concentration trend.

- A negative S value with confidence < 90% and CV > 1 indicates that there is likely no concentration trend.

- A negative S value with confidence < 90% and CV < 1 indicates a stable concentration trend.

- The closer to zero the CV is, the less variation in concentrations between sampling events.

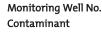
- R<sup>2</sup> is calculated without testing the approximate normality of the data. Additionally, if sample size is < 8, the power of the linear regression is low.

- R<sup>2</sup> values between 0.5 and 0.8 indicate possible correlation, suggesting that there is possibly a trend.

- R<sup>2</sup> values greater than 0.8 indicate a correlation, suggesting that there is likely a trend.

- Effects of Coefficient of Variation based on Table 3.2 (AFCEE, 2000)

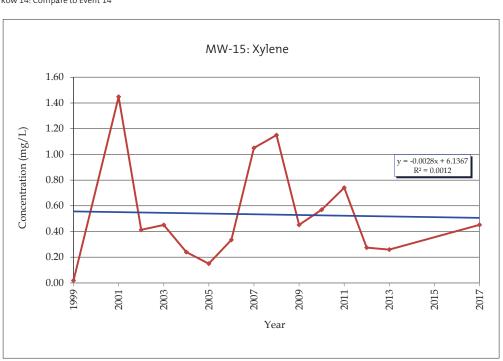
2017



Monitoring Date:

Concentration (mg/L)

Row 1: Compare to Event 1 Row 2: Compare to Event 2 Row 3: Compare to Event 3 Row 4: Compare to Event 4 Row 5: Compare to Event 5 Row 6: Compare to Event 7 Row 8: Compare to Event 7 Row 8: Compare to Event 9 Row 10: Compare to Event 10 Row 11: Compare to Event 11 Row 12: Compare to Event 12 Row 13: Compare to Event 13 Row 14: Compare to Event 13



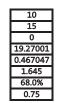
MW-15

**Xylene** 

1999 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2017 Event 1 Event 2 Event 3 Event 4 Event 5 Event 6 Event 7 Event 8 Event 9 Event 10 Event 11 Event 12 Event 13 Event 14 Event 15 0.0192 1.4480 0.4133 0.4511 0.2400 0.1499 0.3349 1.0500 1.1500 0.4520 0.5691 0.7409 0.2741 0.2589 0.4520 1 1 1 1 1 1 1 1 1 1 1 1 1 1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 1 -1 -1 -1 1 1 1 1 1 -1 -1 1 -1 -1 -1 1 1 1 1 1 -1 -1 1 -1 -1 -1 1 1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 1 1 -1 0 1 -1 -1 -1 -1 -1 -1 -1 1 1



Mann-Kendall Statistic (S) = Total Number of Events (n) Groups of Ties / Ties Per Group Variance of S (σ(S)) Z Statisic Z Statisic at α=0.05 or 95% Confidence Level Approxoimate Actual Confidence Level of Z Statistic Coefficient of Variance (CV)



Trend Analysis						
Statistical Method	Result					
Linear Regression	Likely No Trend					
Mann-Kendall	Likely No Trend					

Notes:

A minimum of four (4) independent sampling events are required for the Mann-Kendall test to be valid.
 Non-detects are listed as 1/2 the value of the laboratory detection limit

A negative S value with confidence > 90% and < 95% indicates a probable decreasing concentration trend.</li>
 A negative S value with confidence > 95% indicates a decreasing concentration trend.

- A positive S value with confidence > 90% and < 95% indicates a probable increasing concentration trend.

- A positive S value with confidence > 95% indicates an increasing concentration trend.

- A positive S value with confidence < 90% indicates that there is likely no concentration trend.

- A negative S value with confidence < 90% and CV > 1 indicates that there is likely no concentration trend.

- A negative S value with confidence < 90% and CV < 1 indicates a stable concentration trend.

- The closer to zero the CV is, the less variation in concentrations between sampling events.

-  $R^2$  is calculated without testing the approximate normality of the data. Additionally, if sample size is < 8, the power of the linear regression is low.

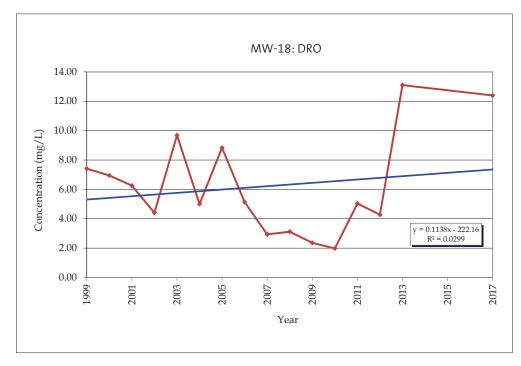
- R<sup>2</sup> values between 0.5 and 0.8 indicate possible correlation, suggesting that there is possibly a trend.

- R<sup>2</sup> values greater than 0.8 indicate a correlation, suggesting that there is likely a trend.

### Monitoring Well No. Contaminant

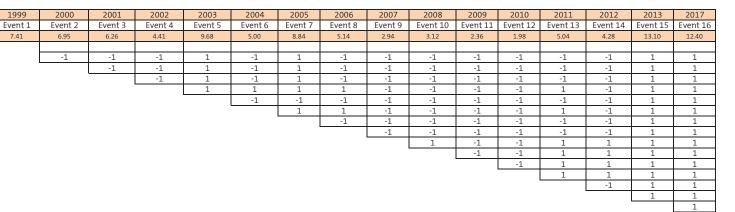
Monitoring Date: Concentration (mg/L)

Row 1: Compare to Event 1 Row 2: Compare to Event 2 Row 3: Compare to Event 3 Row 4: Compare to Event 4 Row 5: Compare to Event 5 Row 6: Compare to Event 5 Row 7: Compare to Event 7 Row 8: Compare to Event 7 Row 9: Compare to Event 9 Row 10: Compare to Event 10 Row 11: Compare to Event 11 Row 12: Compare to Event 12 Row 13: Compare to Event 13 Row 14: Compare to Event 14 Row 15: Compare to Event 14



MW-18

DRO



-7
-6 -5 2
-5
-7 0
-5
-4
3
2
3
4
1
-4 3 2 3 4 1 2 1
1

Mann-Kendall Statistic (S) = Total Number of Events (n) Groups of Ties / Ties Per Group Variance of S (σ(S)) Z Statisic Z Statisic at α=0.05 or 95% Confidence Level Approximate Actual Confidence Level of Z Statistic Coefficient of Variance (CV)

-17
16
0
21.36196
0.748995
1.645
77.3%
0.55

Trend Analysis							
Statistical Method	Result						
Linear Regression	Likely No Trend						
Mann-Kendall	Stable Trend						

Notes:

- A minimum of four (4) independent sampling events are required for the Mann-Kendall test to be valid.
 - Non-detects are listed as 1/2 the value of the laboratory detection limit

- A negative S value with confidence > 90% and < 95% indicates a probable decreasing concentration trend. - A negative S value with confidence > 95% indicates a decreasing concentration trend.

- A positive S value with confidence > 90% and < 95% indicates a probable increasing concentration trend.

- A positive S value with confidence > 95% indicates an increasing concentration trend.
- A positive S value with confidence < 90% indicates that there is likely no concentration trend.
- A negative S value with confidence < 90% and CV > 1 indicates that there is likely no concentration trend.
- A negative S value with confidence < 90% and CV < 1 indicates a stable concentration trend.
- The closer to zero the CV is, the less variation in concentrations between sampling events.
- R<sup>2</sup> is calculated without testing the approximate normality of the data. Additionally, if sample size is < 8, the
  power of the linear regression is low.</li>
- R<sup>2</sup> values between 0.5 and 0.8 indicate possible correlation, suggesting that there is possibly a trend.
- R<sup>2</sup> values greater than 0.8 indicate a correlation, suggesting that there is likely a trend.
- Effects of Coefficient of Variation based on Table 3.2 (AFCEE, 2000)

### Monitoring Well No. Contaminant

MW-18

GRO

2000

Event 2

8.56

1

2001

Event 3

6.12

-1

-1

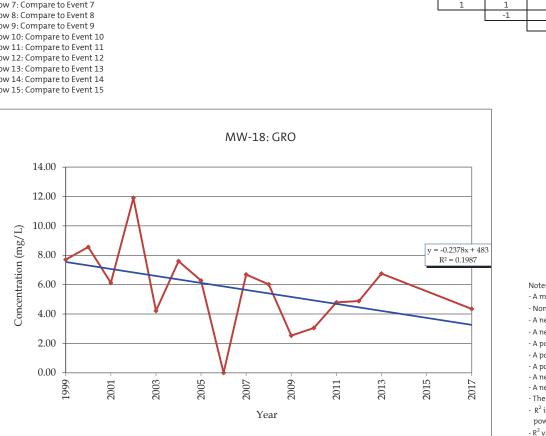
1999

Event 1

7.70

Monitoring Date: Concentration (mg/L)

Row 1: Compare to Event 1 Row 2: Compare to Event 2 Row 3: Compare to Event 3 Row 4: Compare to Event 4 Row 5: Compare to Event 5 Row 6: Compare to Event 6 Row 7: Compare to Event 7 Row 8: Compare to Event 8 Row 9: Compare to Event 9 Row 10: Compare to Event 10 Row 11: Compare to Event 11 Row 12: Compare to Event 12 Row 13: Compare to Event 13 Row 14: Compare to Event 14 Row 15: Compare to Event 15



2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2017
									-			-
Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16
11.90	4.21	7.60	6.28	5.75J	6.69	6.02	2.53	3.05	4.79	4.88	6.75	4.35
1	-1	-1	-1	1	-1	-1	-1	-1	-1	-1	-1	-1
1	-1	-1	-1	1	-1	-1	-1	-1	-1	-1	-1	-1
1	-1	1	1	1	1	-1	-1	-1	-1	-1	1	-1
	-1	-1	-1	1	-1	-1	-1	-1	-1	-1	-1	-1
		1	1	1	1	1	-1	-1	1	1	1	1
			-1	1	-1	-1	-1	-1	-1	-1	-1	-1
				1	1	-1	-1	-1	-1	-1	1	-1
					-1	-1	-1	-1	-1	-1	-1	-1
						-1	-1	-1	-1	-1	1	-1
							-1	-1	-1	-1	1	-1
								1	1	1	1	1
									1	1	1	1
										1	1	-1
											1	-1

-9
-10
-1
-10
7
-8
-3
-8
-5
-4
5 4 1
4
1
0
-1

Mann-Kendall Statistic (S) = Total Number of Events (n) Groups of Ties / Ties Per Group Variance of S ( $\sigma$ (S)) Z Statisic Z Statisic at  $\alpha$ =0.05 or 95% Confidence Level Approximate Actual Confidence Level of Z Statistic Coefficient of Variance (CV)

-41
16
0
21.36196
1.872487
1.645
97.0%
0.39

Trend Analysis							
Statistical Method	Result						
Linear Regression	Likely No Trend						
Mann-Kendall	Decreasing Trend						

-1

Notes:

- A minimum of four (4) independent sampling events are required for the Mann-Kendall test to be valid. - Non-detects are listed as 1/2 the value of the laboratory detection limit

- A negative S value with confidence > 90% and < 95% indicates a probable decreasing concentration trend. - A negative S value with confidence > 95% indicates a decreasing concentration trend.

- A positive S value with confidence > 90% and < 95% indicates a probable increasing concentration trend.

- A positive S value with confidence > 95% indicates an increasing concentration trend.
- A positive S value with confidence < 90% indicates that there is likely no concentration trend.

- A negative S value with confidence < 90% and CV > 1 indicates that there is likely no concentration trend.

- A negative S value with confidence < 90% and CV < 1 indicates a stable concentration trend.
- The closer to zero the CV is, the less variation in concentrations between sampling events.

-  $R^2$  is calculated without testing the approximate normality of the data. Additionally, if sample size is < 8, the power of the linear regression is low.

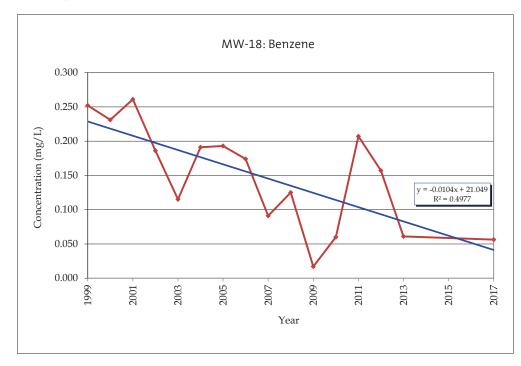
- R<sup>2</sup> values between 0.5 and 0.8 indicate possible correlation, suggesting that there is possibly a trend.

- R<sup>2</sup> values greater than 0.8 indicate a correlation, suggesting that there is likely a trend.

### Monitoring Well No. Contaminant

Monitoring Date: Concentration (mg/L)

Row 1: Compare to Event 1 Row 2: Compare to Event 2 Row 3: Compare to Event 3 Row 4: Compare to Event 4 Row 5: Compare to Event 5 Row 6: Compare to Event 5 Row 7: Compare to Event 7 Row 8: Compare to Event 7 Row 9: Compare to Event 9 Row 10: Compare to Event 9 Row 10: Compare to Event 11 Row 12: Compare to Event 11 Row 13: Compare to Event 13 Row 14: Compare to Event 14 Row 15: Compare to Event 14 Row 15: Compare to Event 14



MW-18

Benzene

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2017
	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16
	0.252	0.231	0.261	0.186	0.115	0.191	0.193	0.174	0.091	0.125	0.017	0.060	0.207	0.157	0.061	0.056
t 1		-1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
t 2			1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
t 3				-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
t 4					-1	1	1	-1	-1	-1	-1	-1	1	-1	-1	-1
t 5						1	1	1	-1	1	-1	-1	1	1	-1	-1
t 6							1	-1	-1	-1	-1	-1	1	-1	-1	-1
t 7								-1	-1	-1	-1	-1	1	-1	-1	-1
t 8									-1	-1	-1	-1	1	-1	-1	-1
t 9										1	-1	-1	1	1	-1	-1
nt 10											-1	-1	1	1	-1	-1
nt 11												1	1	1	1	1
nt 12													1	1	1	-1
nt 13												·		-1	-1	-1
nt 14															-1	-1
nt 15																-1

-13
-12
-13
-6 1 -6
1
-6
-7
-6
-1
-2
5
2
-3
-1 -2 5 2 -3 -2 -1
-1

Mann-Kendall Statistic (S) = Total Number of Events (n) Groups of Ties / Ties Per Group Variance of S (σ(S)) Z Statisic Z Statisic at α=0.05 or 95% Confidence Level Approximate Actual Confidence Level of Z Statistic Coefficient of Variance (CV)

-63
16
0
21.36196
2.902355
1.645
95.0%
0.51

Trend Analysis				
Statistical Method	Result			
Linear Regression	Likely Decreasing Trend			
Mann-Kendall	Probably Decreasing Trend			

Notes:

- A minimum of four (4) independent sampling events are required for the Mann-Kendall test to be valid.
 - Non-detects are listed as 1/2 the value of the laboratory detection limit

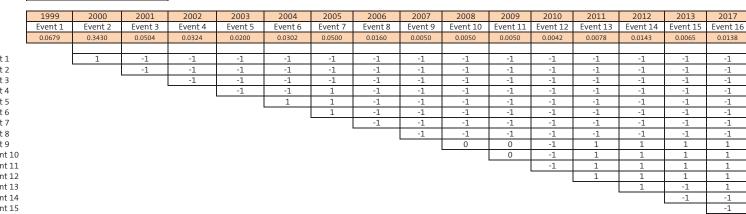
- A negative S value with confidence > 90% and < 95% indicates a probable decreasing concentration trend. - A negative S value with confidence > 95% indicates a decreasing concentration trend.

- A positive S value with confidence > 90% and < 95% indicates a probable increasing concentration trend.
- A positive S value with confidence > 95% indicates an increasing concentration trend.
- A positive S value with confidence < 90% indicates that there is likely no concentration trend.
- A negative S value with confidence < 90% and CV > 1 indicates that there is likely no concentration trend.
- A negative S value with confidence < 90% and CV < 1 indicates a stable concentration trend.
- The closer to zero the CV is, the less variation in concentrations between sampling events.
- $R^2$  is calculated without testing the approximate normality of the data. Additionally, if sample size is < 8, the power of the linear regression is low.
- R<sup>2</sup> values between 0.5 and 0.8 indicate possible correlation, suggesting that there is possibly a trend.
- R<sup>2</sup> values greater than 0.8 indicate a correlation, suggesting that there is likely a trend.
- Effects of Coefficient of Variation based on Table 3.2 (AFCEE, 2000)

### Monitoring Well No. Contaminant

Monitoring Date: Concentration (mg/L)

Row 1: Compare to Event 1 Row 2: Compare to Event 2 Row 3: Compare to Event 3 Row 4: Compare to Event 4 Row 5: Compare to Event 5 Row 6: Compare to Event 6 Row 7: Compare to Event 7 Row 8: Compare to Event 7 Row 9: Compare to Event 9 Row 10: Compare to Event 10 Row 11: Compare to Event 11 Row 12: Compare to Event 12 Row 13: Compare to Event 13 Row 4: Compare to Event 14 Row 15: Compare to Event 15



-13
-14
-13
-10
-7
-8
-9
-8 3 3
3
3
3 4 1
4
1
-2
-1

Mann-Kendall Statistic (S) = Total Number of Events (n) Groups of Ties / Ties Per Group Variance of S (σ(S)) Z Statisic Z Statisic at α=0.05 or 95% Confidence Level Approximate Actual Confidence Level of Z Statistic Coefficient of Variance (CV)

- [	-70
ľ	16
	0
	21.36196
	3.230041
	1.645
	>99.9%
	1.97

Trend Analysis				
Statistical Method	Result			
Linear Regression	Likely No Trend			
Mann-Kendall	Decreasing Trend			

Notes:

- A minimum of four (4) independent sampling events are required for the Mann-Kendall test to be valid.
 - Non-detects are listed as 1/2 the value of the laboratory detection limit

- A negative S value with confidence > 90% and < 95% indicates a probable decreasing concentration trend.

- A negative S value with confidence > 95% indicates a decreasing concentration trend.

- A positive S value with confidence > 90% and < 95% indicates a probable increasing concentration trend.

- A positive S value with confidence > 95% indicates an increasing concentration trend.
- A positive S value with confidence < 90% indicates that there is likely no concentration trend.

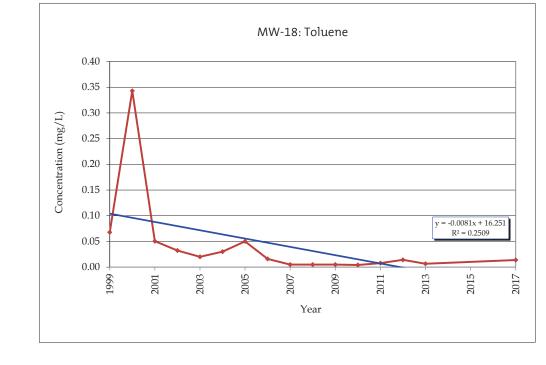
- A negative S value with confidence < 90% and CV > 1 indicates that there is likely no concentration trend.

- A negative S value with confidence < 90% and CV < 1 indicates a stable concentration trend.</li>
   The closer to zero the CV is, the less variation in concentrations between sampling events.
- The closer to zero the CV is, the less variation in concentrations between sampling events

-  $R^2$  is calculated without testing the approximate normality of the data. Additionally, if sample size is < 8, the power of the linear regression is low.

- R<sup>2</sup> values between 0.5 and 0.8 indicate possible correlation, suggesting that there is possibly a trend.
- R<sup>2</sup> values greater than 0.8 indicate a correlation, suggesting that there is likely a trend.

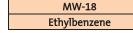
- Effects of Coefficient of Variation based on Table 3.2 (AFCEE, 2000)



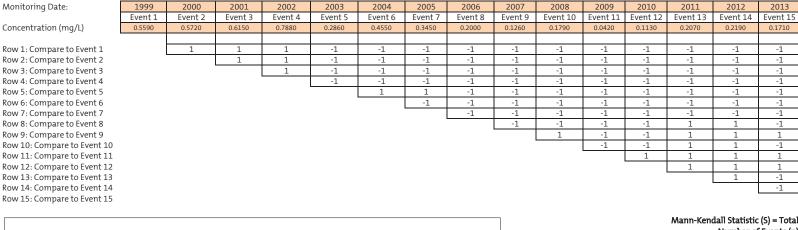
MW-18

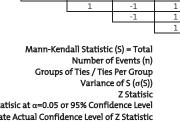
Toluene

### Monitoring Well No. Contaminant



Row 1: Compare to Event 1 Row 2: Compare to Event 2 Row 3: Compare to Event 3 Row 4: Compare to Event 4 Row 5: Compare to Event 5 Row 6: Compare to Event 6 Row 7: Compare to Event 7 Row 8: Compare to Event 8 Row 9: Compare to Event 9 Row 10: Compare to Event 10 Row 11: Compare to Event 11 Row 12: Compare to Event 12 Row 13: Compare to Event 13 Row 14: Compare to Event 14 Row 15: Compare to Event 15





-10
-11
-12
-7
-10
-9
-2
-2 3 0 5 4
0
5
4
1
1 0 1
1

-9

2017

Event 16

0.2450

-1

-1

-1

-1

-1

-1

-1

1

1

1

1

1

1

1

-1

-1

-1

-1

-1

-1

-1

-1

1

-1

1

1

Z Statisic at  $\alpha$ =0.05 or 95% Confidence Level Approximate Actual Confidence Level of Z Statistic Coefficient of Variance (CV)

-57
16
0
21.36196
2.621482
1.645
99.6%
0.67

Trend Analysis				
Statistical Method	Result			
Linear Regression	Likely Decreasing Trend			
Mann-Kendall	Decreasing Trend			

#### Notes:

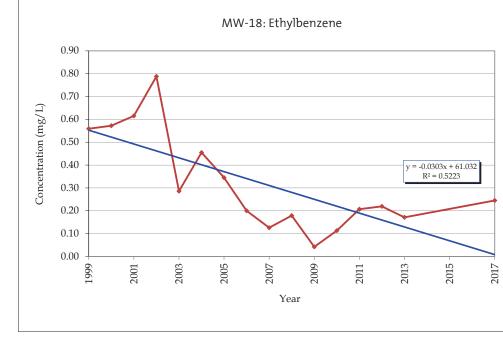
- A minimum of four (4) independent sampling events are required for the Mann-Kendall test to be valid. - Non-detects are listed as 1/2 the value of the laboratory detection limit

- A negative S value with confidence > 90% and < 95% indicates a probable decreasing concentration trend.

- A negative S value with confidence > 95% indicates a decreasing concentration trend.
- A positive S value with confidence > 90% and < 95% indicates a probable increasing concentration trend.
- A positive S value with confidence > 95% indicates an increasing concentration trend.
- A positive S value with confidence < 90% indicates that there is likely no concentration trend.
- A negative S value with confidence < 90% and CV > 1 indicates that there is likely no concentration trend.
- A negative S value with confidence < 90% and CV < 1 indicates a stable concentration trend. - The closer to zero the CV is, the less variation in concentrations between sampling events.

- R<sup>2</sup> is calculated without testing the approximate normality of the data. Additionally, if sample size is < 8, the power of the linear regression is low.

- R<sup>2</sup> values between 0.5 and 0.8 indicate possible correlation, suggesting that there is possibly a trend.
- R<sup>2</sup> values greater than 0.8 indicate a correlation, suggesting that there is likely a trend.



### Monitoring Well No. Contaminant

Monitoring Date: Concentration (mg/L)

Row 1: Compare to Event 1 Row 2: Compare to Event 2 Row 3: Compare to Event 3 Row 4: Compare to Event 4 Row 5: Compare to Event 5 Row 6: Compare to Event 5 Row 7: Compare to Event 7 Row 8: Compare to Event 7 Row 9: Compare to Event 9 Row 10: Compare to Event 9 Row 10: Compare to Event 11 Row 12: Compare to Event 11 Row 13: Compare to Event 13 Row 14: Compare to Event 13 Row 14: Compare to Event 14 Row 15: Compare to Event 14



MW-18

**Xylene** 

1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2017
Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15	Event 16
2.5960	2.5110	2.9070	3.7500	1.5960	2.4390	2.4730	2.3170	1.8500	1.9500	0.0450	1.4270	2.4600	1.9660	1.8080	1.8490
	-1	1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
		1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
			1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
				-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
					1	1	1	1	1	-1	-1	1	1	1	1
						1	-1	-1	-1	-1	-1	1	-1	-1	-1
							-1	-1	-1	-1	-1	-1	-1	-1	-1
								-1	-1	-1	-1	1	-1	-1	-1
									1	-1	-1	1	1	-1	-1
										-1	-1	1	1	-1	-1
											1	1	1	1	1
												1	1	1	1
											-		-1	-1	-1
														-1	-1
															-1

-11
-10
-11
-12
7
-6
-9
-6
-1
-2
-1 -2 5 4
4
-3 -2
-2
-1

Mann-Kendall Statistic (S) = Total Number of Events (n) Groups of Ties / Ties Per Group Variance of S (σ(S)) Z Statisic Z Statisic at α=0.05 or 95% Confidence Level Approximate Actual Confidence Level of Z Statistic Coefficient of Variance (CV)

-57
16
0
21.36196
2.621482
1.645
99.6%
0.37

Trend Analysis				
Statistical Method	Result			
Linear Regression	Likley No Trend			
Mann-Kendall	Decreasing Trend			

Notes:

- A minimum of four (4) independent sampling events are required for the Mann-Kendall test to be valid.
 - Non-detects are listed as 1/2 the value of the laboratory detection limit

- A negative S value with confidence > 90% and < 95% indicates a probable decreasing concentration trend.

- A negative S value with confidence > 95% indicates a decreasing concentration trend.
- A positive S value with confidence > 90% and < 95% indicates a probable increasing concentration trend.
- A positive S value with confidence > 95% indicates an increasing concentration trend.
- A positive S value with confidence < 90% indicates that there is likely no concentration trend.

- A negative S value with confidence < 90% and CV > 1 indicates that there is likely no concentration trend.

- A negative S value with confidence < 90% and CV < 1 indicates a stable concentration trend.
- The closer to zero the CV is, the less variation in concentrations between sampling events.

-  $R^2$  is calculated without testing the approximate normality of the data. Additionally, if sample size is < 8, the power of the linear regression is low.

- R<sup>2</sup> values between 0.5 and 0.8 indicate possible correlation, suggesting that there is possibly a trend.
- R<sup>2</sup> values greater than 0.8 indicate a correlation, suggesting that there is likely a trend.

Event 9

7.4000

1

1

1

1

1

1

1

-1

2008

Event 10

1

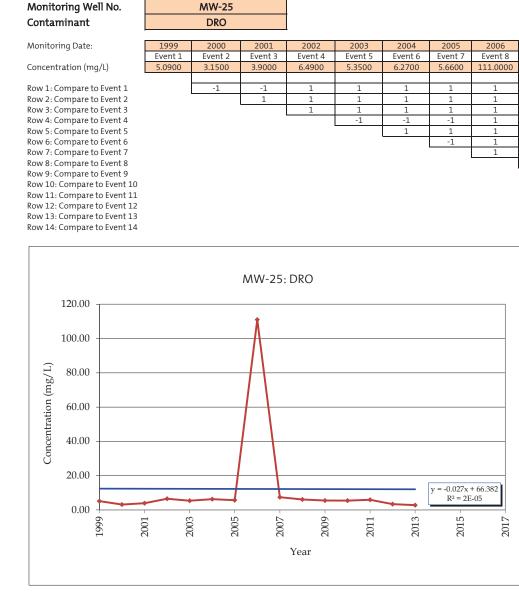
1

1

-1

2009

Event 11



6.0600 5.4900 5.4200 5.8900 3.3500 1 1 1 -1 1 1 1 1 1 1 1 1 1 -1 -1 -1 -1 -1 -1 1 -1 1 1 -1 -1 -1 -1 -1 -1 -1 1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 1 -1 1 -1

Event 12

2011

Event 13

2012

Event 14

-1

2013

Event 15

2.7800

-1

-1

-1

-1

-1

-1

-1

-1

-1

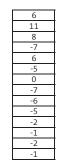
-1

-1

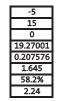
-1

-1

-1



Mann-Kendall Statistic (S) = Total Number of Events (n) Groups of Ties / Ties Per Group Variance of S ( $\sigma$ (S)) Z Statisic Z Statisic at α=0.05 or 95% Confidence Level Approximate Actual Confidence Level of Z Statistic Coefficient of Variance (CV)



Trend Analysis		
Statistical Method	Result	
Linear Regression	Likely No Trend	
Mann-Kendall	Likely No Trend	

Notes:

- A minimum of four (4) independent sampling events are required for the Mann-Kendall test to be valid. - Non-detects are listed as 1/2 the value of the laboratory detection limit

- A negative S value with confidence > 90% and < 95% indicates a probable decreasing concentration trend. - A negative S value with confidence > 95% indicates a decreasing concentration trend.

- A positive S value with confidence > 90% and < 95% indicates a probable increasing concentration trend.

- A positive S value with confidence > 95% indicates an increasing concentration trend.

- A positive S value with confidence < 90% indicates that there is likely no concentration trend.

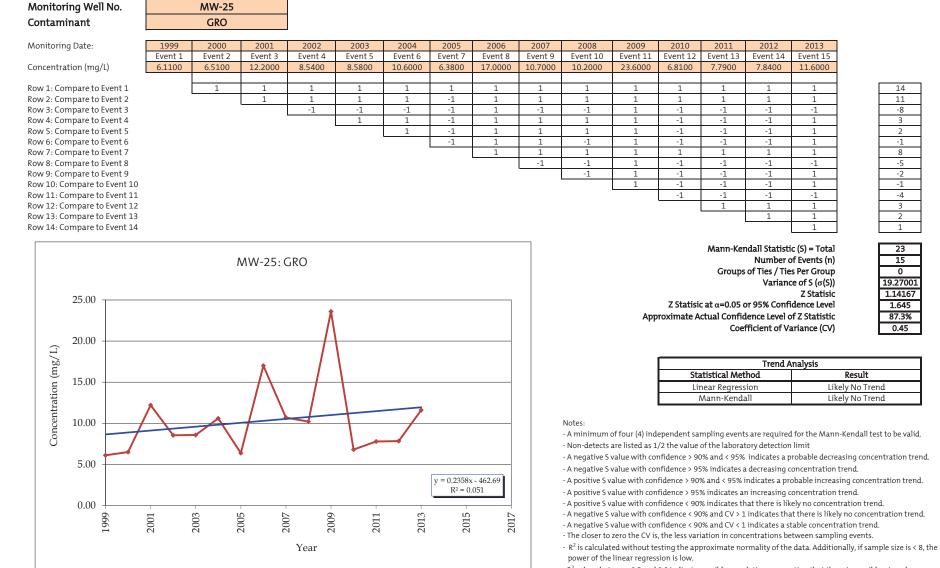
- A negative S value with confidence < 90% and CV > 1 indicates that there is likely no concentration trend. - A negative S value with confidence < 90% and CV < 1 indicates a stable concentration trend.

- The closer to zero the CV is, the less variation in concentrations between sampling events.

- R<sup>2</sup> is calculated without testing the approximate normality of the data. Additionally, if sample size is < 8, the power of the linear regression is low.

- R<sup>2</sup> values between 0.5 and 0.8 indicate possible correlation, suggesting that there is possibly a trend.

- R<sup>2</sup> values greater than 0.8 indicate a correlation, suggesting that there is likely a trend.



- R<sup>2</sup> values between 0.5 and 0.8 indicate possible correlation, suggesting that there is possibly a trend.

14

11

-8

3

2

-1

8

-5

-2

-1

-4

3

2

1

23

15

0

19.27001

1.14167

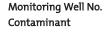
1.645

87.3%

0.45

Result

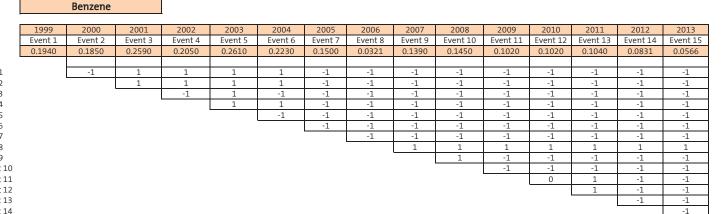
- R<sup>2</sup> values greater than 0.8 indicate a correlation, suggesting that there is likely a trend.



Monitoring Date:

Concentration (mg/L)

Row 1: Compare to Event 1 Row 2: Compare to Event 2 Row 3: Compare to Event 3 Row 4: Compare to Event 4 Row 5: Compare to Event 5 Row 6: Compare to Event 7 Row 8: Compare to Event 7 Row 8: Compare to Event 9 Row 10: Compare to Event 10 Row 10: Compare to Event 11 Row 12: Compare to Event 11 Row 12: Compare to Event 11 Row 13: Compare to Event 11 Row 14: Compare to Event 14



-6
-5
-10
-7
-10
-9
-8
7
-4
-5
-1
-1 -2
-2
-1

Mann-Kendall Statistic (S) = Total Number of Events (n) Groups of Ties / Ties Per Group Variance of S (σ(S)) Z Statisic Z Statisic at α=0.05 or 95% Confidence Level Approxoimate Actual Confidence Level of Z Statistic Coefficient of Variance (CV)

-62 15 1/2 19.27001 3.16554 1.645 >99.9% 0.47		
1/2 19.27001 3.16554 1.645 >99.9%	-62	
19.27001 3.16554 1.645 >99.9%	15	
3.16554 1.645 >99.9%	1/2	
1.645 >99.9%	19.27001	
>99.9%	3.16554	
	1.645	
0.47	>99.9%	
	0.47	

Trend Analysis				
Statistical Method	Result			
Linear Regression	Possible Decreasing Trend			
Mann-Kendall	Decreasing Trend			

Notes:

A minimum of four (4) independent sampling events are required for the Mann-Kendall test to be valid.
 Non-detects are listed as 1/2 the value of the laboratory detection limit

- A negative S value with confidence > 90% and < 95% indicates a probable decreasing concentration trend. - A negative S value with confidence > 95% indicates a decreasing concentration trend.

A positive S value with confidence > 90% and < 95% indicates a probable increasing concentration trend.</li>
 A positive S value with confidence > 95% indicates an increasing concentration trend.

- A positive S value with confidence < 90% indicates that there is likely no concentration trend.

- A negative S value with confidence < 90% and CV > 1 indicates that there is likely no concentration trend.

- A negative S value with confidence < 90% and CV < 1 indicates a stable concentration trend.

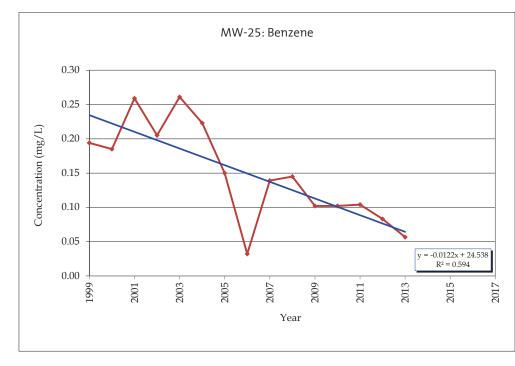
- The closer to zero the CV is, the less variation in concentrations between sampling events.

R<sup>2</sup> is calculated without testing the approximate normality of the data. Additionally, if sample size is < 8, the
power of the linear regression is low.</li>

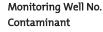
- R<sup>2</sup> values between 0.5 and 0.8 indicate possible correlation, suggesting that there is possibly a trend.

- R<sup>2</sup> values greater than 0.8 indicate a correlation, suggesting that there is likely a trend.

- Effects of Coefficient of Variation based on Table 3.2 (AFCEE, 2000)



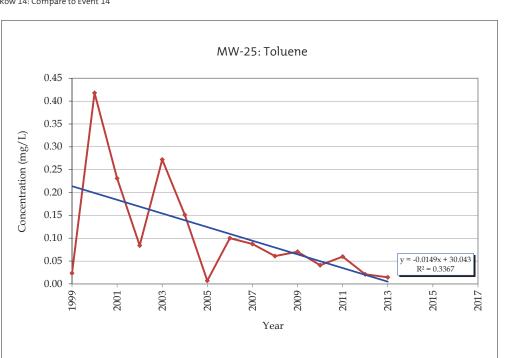
MW-25



Monitoring Date:

Concentration (mg/L) Row 1: Compare to Event 1

Row 2: Compare to Event 2 Row 3: Compare to Event 3 Row 4: Compare to Event 4 Row 5: Compare to Event 5 Row 6: Compare to Event 7 Row 8: Compare to Event 7 Row 8: Compare to Event 7 Row 9: Compare to Event 9 Row 10: Compare to Event 10 Row 11: Compare to Event 112 Row 12: Compare to Event 113 Row 14: Compare to Event 14



MW-25

Toluene

1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7	Event 8	Event 9	Event 10	Event 11	Event 12	Event 13	Event 14	Event 15
0.0235	0.4180	0.2310	0.0839	0.2720	0.1510	0.0069	0.1000	0.0873	0.0608	0.0705	0.0409	0.0597	0.0211	0.0144
	1	1	1	1	1	-1	1	1	1	1	1	1	-1	-1
		-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
			-1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
				1	1	-1	1	1	-1	-1	-1	-1	-1	-1
					-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
					-	-1	-1	-1	-1	-1	-1	-1	-1	-1
							1	1	1	1	1	1	1	1
								-1	-1	-1	-1	-1	-1	-1
									-1	-1	-1	-1	-1	-1
									•	1	-1	-1	-1	-1
											-1	-1	-1	-1
											•	1	-1	-1
													-1	-1
														-1

8	
-13	
-10	
-3	
-10	
-9	
8	
-7	
-6	
-3	
-4	
-1	
-2	
-1	L

Mann-Kendall Statistic (S) = Total Number of Events (n) Groups of Ties / Ties Per Group Variance of S (σ(S)) Z Statisic Z Statisic at α=0.05 or 95% Confidence Level Approxoimate Actual Confidence Level of Z Statistic Coefficient of Variance (CV)

-53
15
0
19.27001
2.698493
1.645
99.6%
1.05

Trend Analysis				
Statistical Method	Result			
Linear Regression	Possible Decreasing Trend			
Mann-Kendall	Decreasing Trend			

Notes:

- A minimum of four (4) independent sampling events are required for the Mann-Kendall test to be valid.
 - Non-detects are listed as 1/2 the value of the laboratory detection limit

A negative S value with confidence > 90% and < 95% indicates a probable decreasing concentration trend.</li>
 A negative S value with confidence > 95% indicates a decreasing concentration trend.

- A positive S value with confidence > 90% and < 95% indicates a probable increasing concentration trend.

- A positive S value with confidence > 95% indicates an increasing concentration trend.

- A positive S value with confidence < 90% indicates that there is likely no concentration trend.

- A negative S value with confidence < 90% and CV > 1 indicates that there is likely no concentration trend. - A negative S value with confidence < 90% and CV < 1 indicates a stable concentration trend.

The closer to zero the CV is, the less variation in concentrations between sampling events.

-  $R^2$  is calculated without testing the approximate normality of the data. Additionally, if sample size is < 8, the power of the linear regression is low.

- R<sup>2</sup> values between 0.5 and 0.8 indicate possible correlation, suggesting that there is possibly a trend.

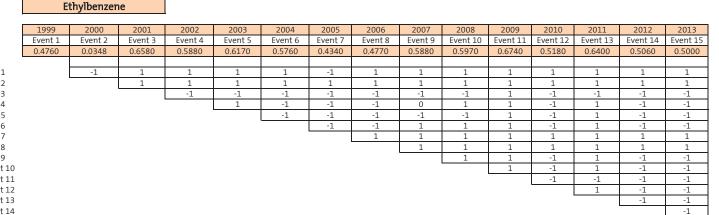
- R<sup>2</sup> values greater than 0.8 indicate a correlation, suggesting that there is likely a trend.

# Monitoring Well No. Contaminant

Monitoring Date:

Concentration (mg/L)

Row 1: Compare to Event 1 Row 2: Compare to Event 2 Row 3: Compare to Event 3 Row 4: Compare to Event 4 Row 5: Compare to Event 5 Row 6: Compare to Event 7 Row 8: Compare to Event 7 Row 8: Compare to Event 9 Row 10: Compare to Event 10 Row 11: Compare to Event 11 Row 12: Compare to Event 12 Row 13: Compare to Event 14 Row 14: Compare to Event 14





Mann-Kendall Statistic (S) = Total Number of Events (n) Groups of Ties / Ties Per Group Variance of S (σ(S)) Z Statisic Z Statisic at α=0.05 or 95% Confidence Level Approximate Actual Confidence Level of Z Statistic Coefficient of Variance (CV)

10	
15	
0	
19.27001	
0.467047	
1.645	
68.0%	
0.29	

Trend Analysis					
Statistical Method	Result				
Linear Regression	Likely No Trend				
Mann-Kendall	Likely No Trend				

Notes:

A minimum of four (4) independent sampling events are required for the Mann-Kendall test to be valid.
 Non-detects are listed as 1/2 the value of the laboratory detection limit

A negative S value with confidence > 90% and < 95% indicates a probable decreasing concentration trend.</li>
 A negative S value with confidence > 95% indicates a decreasing concentration trend.

A positive S value with confidence > 90% and < 95% indicates a probable increasing concentration trend.</li>
 A positive S value with confidence > 95% indicates an increasing concentration trend.

A positive 5 value with confidence > 95% indicates an increasing concentration trend.
 A positive 5 value with confidence < 90% indicates that there is likely no concentration trend.</li>

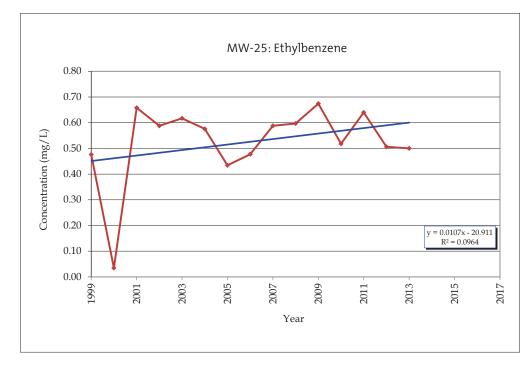
- A negative S value with confidence < 90% and CV > 1 indicates that there is likely no concentration trend.

- A negative S value with confidence < 90% and CV < 1 indicates a stable concentration trend.</li>
 - The closer to zero the CV is, the less variation in concentrations between sampling events.

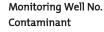
- R<sup>2</sup> is calculated without testing the approximate normality of the data. Additionally, if sample size is < 8, the
power of the linear regression is low.</li>

-  $R^2$  values between 0.5 and 0.8 indicate possible correlation, suggesting that there is possibly a trend. -  $R^2$  values greater than 0.8 indicate a correlation, suggesting that there is likely a trend.

- Effects of Coefficient of Variation based on Table 3.2 (AFCEE, 2000)



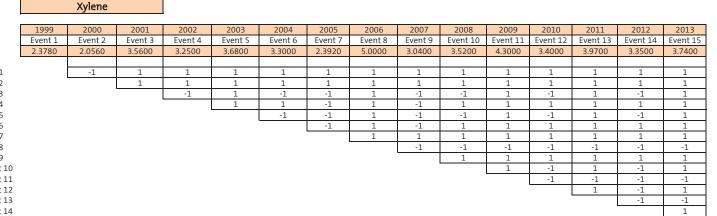
**MW-25** 



Monitoring Date:

Concentration (mg/L)

Row 1: Compare to Event 1 Row 2: Compare to Event 2 Row 3: Compare to Event 3 Row 4: Compare to Event 4 Row 5: Compare to Event 5 Row 6: Compare to Event 6 Row 7: Compare to Event 7 Row 8: Compare to Event 8 Row 9: Compare to Event 9 Row 10: Compare to Event 10 Row 11: Compare to Event 11 Row 12: Compare to Event 12 Row 13: Compare to Event 13 Row 14: Compare to Event 14





Mann-Kendall Statistic (S) = Total Number of Events (n) Groups of Ties / Ties Per Group Variance of S ( $\sigma$ (S)) Z Statisic Z Statisic at α=0.05 or 95% Confidence Level Approximate Actual Confidence Level of Z Statistic Coefficient of Variance (CV)

37	
15	
0	
19.27001	
1.868188	
1.645	
96.9%	
0.22	

Trend Analysis					
Statistical Method	Result				
Linear Regression	Possible Increasing Trend				
Mann-Kendall	Increasing Trend				

Notes:

- A minimum of four (4) independent sampling events are required for the Mann-Kendall test to be valid. - Non-detects are listed as 1/2 the value of the laboratory detection limit

- A negative S value with confidence > 90% and < 95% indicates a probable decreasing concentration trend. - A negative S value with confidence > 95% indicates a decreasing concentration trend.

- A positive S value with confidence > 90% and < 95% indicates a probable increasing concentration trend.

- A positive S value with confidence > 95% indicates an increasing concentration trend. - A positive S value with confidence < 90% indicates that there is likely no concentration trend.

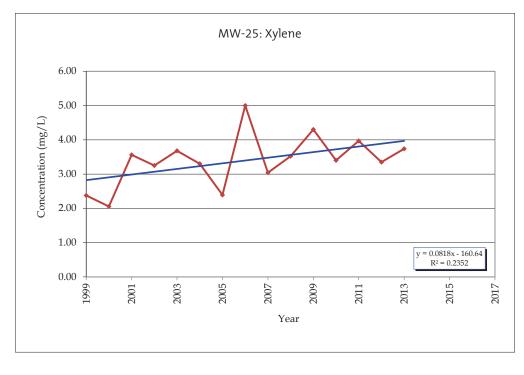
- A negative S value with confidence < 90% and CV > 1 indicates that there is likely no concentration trend.

- A negative S value with confidence < 90% and CV < 1 indicates a stable concentration trend.
- The closer to zero the CV is, the less variation in concentrations between sampling events.

-  $R^2$  is calculated without testing the approximate normality of the data. Additionally, if sample size is < 8, the power of the linear regression is low.

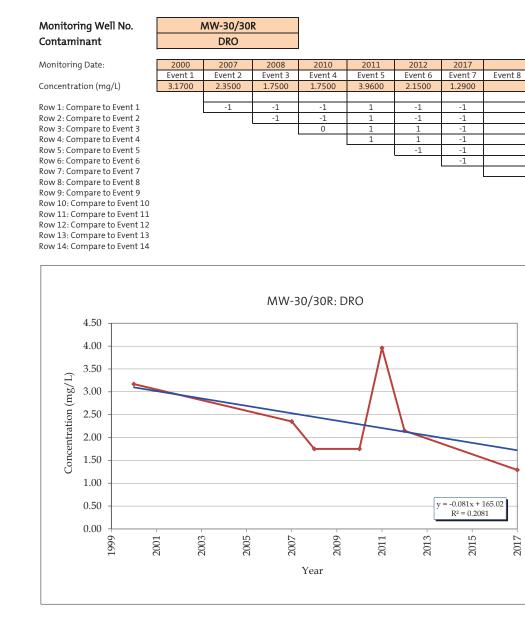
- R<sup>2</sup> values between 0.5 and 0.8 indicate possible correlation, suggesting that there is possibly a trend. - R<sup>2</sup> values greater than 0.8 indicate a correlation, suggesting that there is likely a trend.

- Effects of Coefficient of Variation based on Table 3.2 (AFCEE, 2000)



**MW-25** 

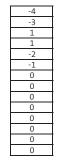
Event 9



Mann-Kendall Statistic (S) = Total Number of Events (n) Groups of Ties / Ties Per Group Variance of S ( $\sigma$ (S)) Z Statisic Z Statisic at α=0.05 or 95% Confidence Level Approxoimate Actual Confidence Level of Z Statistic

Coefficient of Variance (CV)

Event 10 Event 11 Event 12 Event 13 Event 14 Event 15



-8	
7	
1/2	
2.708013	
2.584921	
1.645	
99.5%	
0.39	

Trend Analysis	
Statistical Method	Result
Linear Regression	Possible Decreasing Trend
Mann-Kendall	Decreasing Trend

Notes:

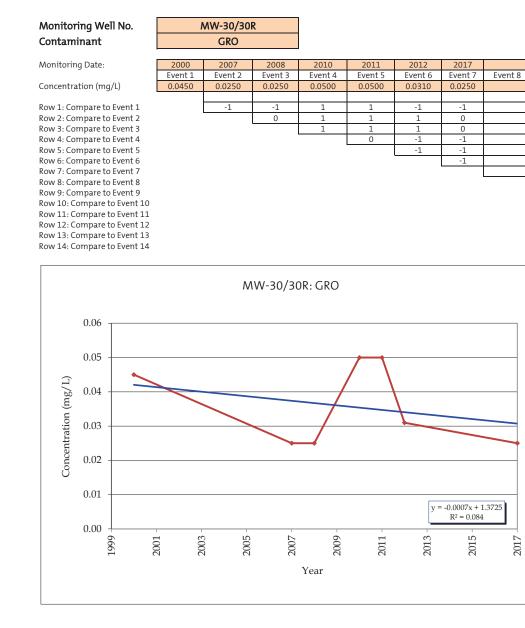
- A minimum of four (4) independent sampling events are required for the Mann-Kendall test to be valid. - Non-detects are listed as 1/2 the value of the laboratory detection limit

- A negative S value with confidence > 90% and < 95% indicates a probable decreasing concentration trend. - A negative S value with confidence > 95% indicates a decreasing concentration trend.

- A positive S value with confidence > 90% and < 95% indicates a probable increasing concentration trend.
- A positive S value with confidence > 95% indicates an increasing concentration trend.
- A positive S value with confidence < 90% indicates that there is likely no concentration trend.
- A negative S value with confidence < 90% and CV > 1 indicates that there is likely no concentration trend.
- A negative S value with confidence < 90% and CV < 1 indicates a stable concentration trend. - The closer to zero the CV is, the less variation in concentrations between sampling events.
- $R^2$  is calculated without testing the approximate normality of the data. Additionally, if sample size is < 8, the power of the linear regression is low.
- R<sup>2</sup> values between 0.5 and 0.8 indicate possible correlation, suggesting that there is possibly a trend.
- R<sup>2</sup> values greater than 0.8 indicate a correlation, suggesting that there is likely a trend.
- Effects of Coefficient of Variation based on Table 3.2 (AFCEE, 2000)

2017

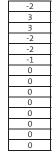
Event 9



Mann-Kendall Statistic (S) = Total Number of Events (n) Groups of Ties / Ties Per Group Variance of S (σ(S)) Z Statisic Z Statisic at α=0.05 or 95% Confidence Level

Coefficient of Variance (CV)

Event 10 Event 11 Event 12 Event 13 Event 14 Event 15



-1	
7	
2/3,2	
2.708013	
0	
1.645	
50.0%	
0.33	

Trend Analysis	
Statistical Method	Result
Linear Regression	Likley No Trend
Mann-Kendall	Probable Decreasing Trend

Notes:

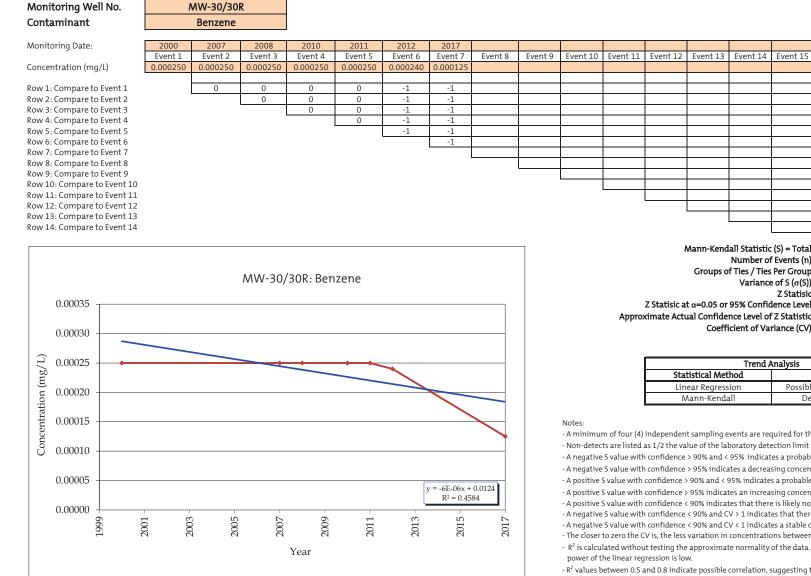
A minimum of four (4) independent sampling events are required for the Mann-Kendall test to be valid.
 Non-detects are listed as 1/2 the value of the laboratory detection limit

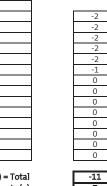
- A negative S value with confidence > 90% and < 95% indicates a probable decreasing concentration trend. - A negative S value with confidence > 95% indicates a decreasing concentration trend.

- A positive S value with confidence > 90% and < 95% indicates a probable increasing concentration trend.
- A positive S value with confidence > 95% indicates an increasing concentration trend.

Approximate Actual Confidence Level of Z Statistic

- A positive S value with confidence < 90% indicates that there is likely no concentration trend.
- A negative S value with confidence < 90% and CV > 1 indicates that there is likely no concentration trend.
- A negative S value with confidence < 90% and CV < 1 indicates a stable concentration trend. - The closer to zero the CV is, the less variation in concentrations between sampling events.
- R<sup>2</sup> is calculated without testing the approximate normality of the data. Additionally, if sample size is < 8, the
  power of the linear regression is low.</li>
- R<sup>2</sup> values between 0.5 and 0.8 indicate possible correlation, suggesting that there is possibly a trend.
- R<sup>2</sup> values greater than 0.8 indicate a correlation, suggesting that there is likely a trend.
- Effects of Coefficient of Variation based on Table 3.2 (AFCEE, 2000)





Mann-Kendall Statistic (S) = Total Number of Events (n) Groups of Ties / Ties Per Group Variance of S ( $\sigma$ (S)) Z Statisic Z Statisic at α=0.05 or 95% Confidence Level Approximate Actual Confidence Level of Z Statistic Coefficient of Variance (CV)

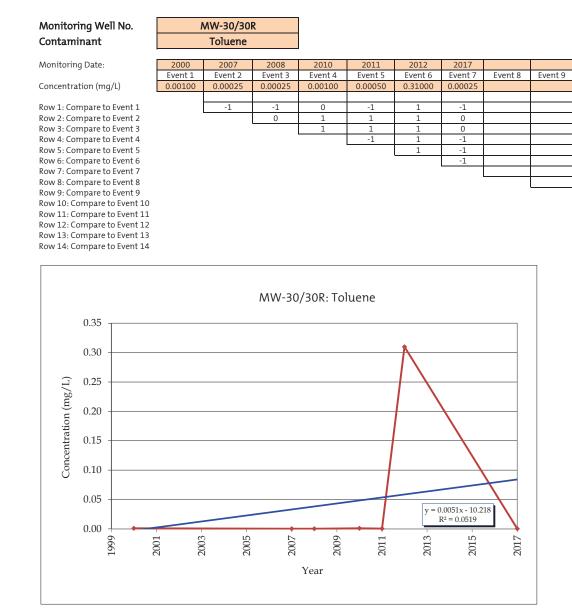


Trend Analysis	
Statistical Method	Result
Linear Regression	Possible Decreasing Trend
Mann-Kendall	Decreasing Trend

- A minimum of four (4) independent sampling events are required for the Mann-Kendall test to be valid. - Non-detects are listed as 1/2 the value of the laboratory detection limit

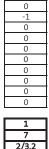
- A negative S value with confidence > 90% and < 95% indicates a probable decreasing concentration trend. - A negative S value with confidence > 95% indicates a decreasing concentration trend.

- A positive S value with confidence > 90% and < 95% indicates a probable increasing concentration trend.
- A positive S value with confidence > 95% indicates an increasing concentration trend.
- A positive S value with confidence < 90% indicates that there is likely no concentration trend.
- A negative S value with confidence < 90% and CV > 1 indicates that there is likely no concentration trend.
- A negative S value with confidence < 90% and CV < 1 indicates a stable concentration trend. - The closer to zero the CV is, the less variation in concentrations between sampling events.
- $R^2$  is calculated without testing the approximate normality of the data. Additionally, if sample size is < 8, the power of the linear regression is low.
- R<sup>2</sup> values between 0.5 and 0.8 indicate possible correlation, suggesting that there is possibly a trend.
- R<sup>2</sup> values greater than 0.8 indicate a correlation, suggesting that there is likely a trend.
- Effects of Coefficient of Variation based on Table 3.2 (AFCEE, 2000)



Mann-Kendall Statistic (S) = Total Number of Events (n) Groups of Ties / Ties Per Group Variance of S (σ(S)) Z Statisic Z Statisic at α=0.05 or 95% Confidence Level Approximate Actual Confidence Level of Z Statistic Coefficient of Variance (CV)

Event 10 Event 11 Event 12 Event 13 Event 14 Event 15



-3

3

3

-1

1	
7	
2/3,2	
2.708013	
0	
1.645	
50.0%	
2.61	

Trend Analysis	
Statistical Method	Result
Linear Regression	Likley No Trend
Mann-Kendall	Likley No Trend

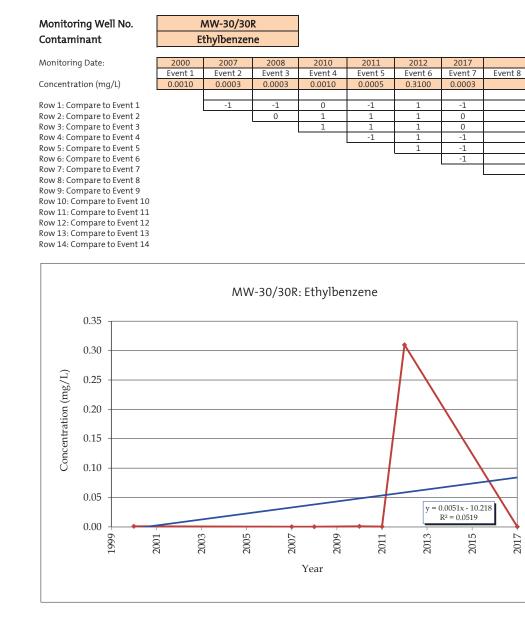
Notes:

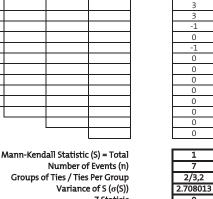
A minimum of four (4) independent sampling events are required for the Mann-Kendall test to be valid.
 Non-detects are listed as 1/2 the value of the laboratory detection limit

- A negative S value with confidence > 90% and < 95% indicates a probable decreasing concentration trend. - A negative S value with confidence > 95% indicates a decreasing concentration trend.

- A positive S value with confidence > 90% and < 95% indicates a probable increasing concentration trend.
- A positive S value with confidence > 95% indicates an increasing concentration trend.
- A positive S value with confidence < 90% indicates that there is likely no concentration trend.
- A negative S value with confidence < 90% and CV > 1 indicates that there is likely no concentration trend.
- A negative S value with confidence < 90% and CV < 1 indicates a stable concentration trend. - The closer to zero the CV is, the less variation in concentrations between sampling events.
- R<sup>2</sup> is calculated without testing the approximate normality of the data. Additionally, if sample size is < 8, the
  power of the linear regression is low.</li>
- R<sup>2</sup> values between 0.5 and 0.8 indicate possible correlation, suggesting that there is possibly a trend.
- R<sup>2</sup> values greater than 0.8 indicate a correlation, suggesting that there is likely a trend.
- Effects of Coefficient of Variation based on Table 3.2 (AFCEE, 2000)

Event 9





-3

3

3

-1

0

-1

0

0

0

0

0

0

0

0

1

7

Z Statisic	0
Z Statisic at $\alpha$ =0.05 or 95% Confidence Level	1.645
Approximate Actual Confidence Level of Z Statistic	50.0%
Coefficient of Variance (CV)	2.61

Trend Analysis		
Statistical Method	Result	
Linear Regression	Likley No Trend	
Mann-Kendall	Likley No Trend	

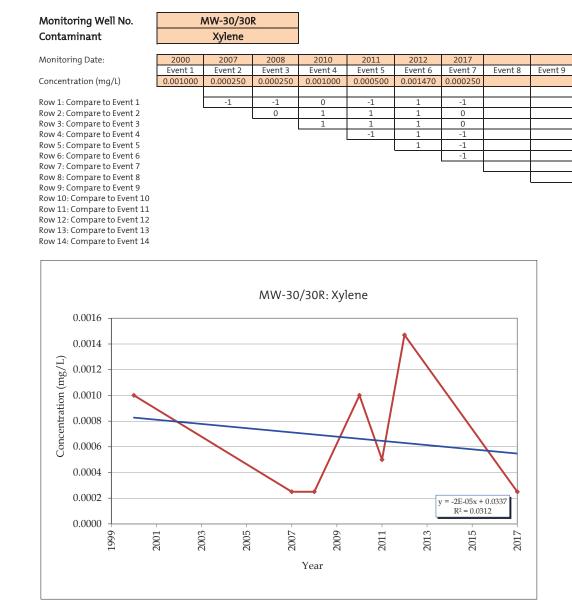
#### Notes:

- A minimum of four (4) independent sampling events are required for the Mann-Kendall test to be valid. - Non-detects are listed as 1/2 the value of the laboratory detection limit

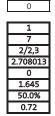
- A negative S value with confidence > 90% and < 95% indicates a probable decreasing concentration trend. - A negative S value with confidence > 95% indicates a decreasing concentration trend.

- A positive S value with confidence > 90% and < 95% indicates a probable increasing concentration trend.
- A positive S value with confidence > 95% indicates an increasing concentration trend.
- A positive S value with confidence < 90% indicates that there is likely no concentration trend.
- A negative S value with confidence < 90% and CV > 1 indicates that there is likely no concentration trend.
- A negative S value with confidence < 90% and CV < 1 indicates a stable concentration trend. - The closer to zero the CV is, the less variation in concentrations between sampling events.
- $R^2$  is calculated without testing the approximate normality of the data. Additionally, if sample size is < 8, the power of the linear regression is low.
- R<sup>2</sup> values between 0.5 and 0.8 indicate possible correlation, suggesting that there is possibly a trend.
- R<sup>2</sup> values greater than 0.8 indicate a correlation, suggesting that there is likely a trend.
- Effects of Coefficient of Variation based on Table 3.2 (AFCEE, 2000)

Event 10 Event 11 Event 12 Event 13 Event 14 Event 15



Mann-Kendall Statistic (S) = Total Number of Events (n) Groups of Ties / Ties Per Group Variance of S (σ(S)) Z Statisic Z Statisic at α=0.05 or 95% Confidence Level



-3

3

3

-1

0

-1

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0

0

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0

0

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Trend Analysis	
Statistical Method	Result
Linear Regression	Likley No Trend
Mann-Kendall	Likley No Trend

Coefficient of Variance (CV)

Notes:

A minimum of four (4) independent sampling events are required for the Mann-Kendall test to be valid.
 Non-detects are listed as 1/2 the value of the laboratory detection limit

- A negative S value with confidence > 90% and < 95% indicates a probable decreasing concentration trend. - A negative S value with confidence > 95% indicates a decreasing concentration trend.

- A positive S value with confidence > 90% and < 95% indicates a probable increasing concentration trend.
- A positive S value with confidence > 95% indicates an increasing concentration trend.

Approximate Actual Confidence Level of Z Statistic

- A positive S value with confidence < 90% indicates that there is likely no concentration trend.
- A negative S value with confidence < 90% and CV > 1 indicates that there is likely no concentration trend.
- A negative S value with confidence < 90% and CV < 1 indicates a stable concentration trend.
- The closer to zero the CV is, the less variation in concentrations between sampling events.
- $R^2$  is calculated without testing the approximate normality of the data. Additionally, if sample size is < 8, the power of the linear regression is low.
- R<sup>2</sup> values between 0.5 and 0.8 indicate possible correlation, suggesting that there is possibly a trend.
- R<sup>2</sup> values greater than 0.8 indicate a correlation, suggesting that there is likely a trend.
- Effects of Coefficient of Variation based on Table 3.2 (AFCEE, 2000)

Event 10 Event 11 Event 12 Event 13 Event 14 Event 15