



MEMORANDUM

To: Mr. Jerome Cruz
Washington State Department of Ecology

Ms. Nduta Mbutia
City of Bothell

From: Mr. John Kane, Kane Environmental, Inc.

Date: January 26, 2021

Re: Groundwater Sampling with Variable Pumping Rate
Bothell Service Center Simon & Son
18107 Bothell Way NE, Bothell Washington

A handwritten signature in blue ink that reads "John Kane". The signature is written in a cursive style and is positioned to the right of the "Date:" field.

Kane Environmental, Inc. (Kane Environmental) is pleased to present this memo regarding the procedures and results for variable pumping rate sampling of groundwater monitoring well MW-42 at the Bothell Service Center Simon & Son (BSCSS) Site (the Site). See Figure 1 for a site map.

INTRODUCTION

On October 26, 2020, Kane Environmental sampled the deep screened groundwater monitoring well MW-42 using a series of sampling regimes. The goal of the sampling regime was to purge groundwater from MW-42 at multiple pumping rates prior to sample collection to determine if the radius of influence of MW-42 would capture groundwater representative of the previous deep groundwater well MW-9 screened interval. This would confirm that quarterly groundwater samples collected from MW-42 are representative of water quality associated with the deep source area characterized in the Remedial Investigation (RI).

GROUNDWATER SAMPLING PROCEDURES

General

Prior to collecting groundwater samples, the depth to groundwater at each well was measured with a decontaminated electric water interface probe. MW-42 was sampled three times using three different pumping rates and sampling methods. First, MW-42 was sampled using a peristaltic pump with new polyethylene tubing, purging at low-flow rates. Second, MW-42 was sampled also using peristaltic pump with polyethylene tubing, but pumping at an increased rate. Third, MW-42 was sampled using a submersible pump and controller with new polyvinyl chloride (PVC) tubing, purging at relatively high rates.

Depth to groundwater was recorded during the purging activities of each of the three methods at MW-42 using decontaminated electric water interface probe and at the nearby well MW-43 using a programmable pressure transducer and datalogger.

During the purging by peristaltic pump, field parameters, including pH, temperature, conductivity, oxidation reduction potential (ORP), and dissolved oxygen (DO) were recorded and allowed to stabilize for three consecutive readings prior to collecting each groundwater sample. Field parameters were not collected during the submersible pump purging due to the rate of pumping and volume of water removed. Groundwater was placed into appropriate laboratory-supplied, pre-cleaned and preserved containers for analysis. Samples were labeled and placed into an ice-filled cooler. Groundwater samples were transported under standard chain-of-custody procedures to an Ecology-accredited analytical laboratory.

Groundwater monitoring well sampling nomenclature identified each sample with the well identification number, followed by a “W” and then a number designation representing the method used. For example, sample “MW-42:W” was the groundwater sample collected using the peristaltic pump with low-flow purging, “MW-42:W-2” was the groundwater sample collected using the peristaltic pump with increased pumping rate, and “MW-42:W-3” was the groundwater sample collected using the submersible pump with relatively high pumping rate.

Pumping Rates

Table 1 below includes the time spent purging MW-42 during each sampling method, the approximate pumping rate, the approximate volume of water removed, the observed drawdown at MW-42, and the observed drawdown at MW-43.

**Table 1
 Well Purging Data**

Sample ID	Pumping Rate (GPM)	Purge Time (Minutes)	Volume Removed (Gallons)	Observed Drawdown MW-42 (Feet BTOC)	Observed Drawdown MW-43 (Feet BTOC)
MW-42:W	0.04	25	1	0.07	0.013
MW-42:W-2	0.10	35	3.5	0.16	0.018
MW-42:W-3	2.88	25	72	4.83	0.300

GPM – Gallons per minute
 BTOC – Below top of casing

ANALYTICAL RESULTS

Analytical results from the three samples collected are included in Table 2 below:

Table 2
Analytical Results

Sample ID	Date	PCE (ug/L)	TCE (ug/L)	(cis) 1,2-DCE (ug/L)	Vinyl Chloride (ug/L)
MW-42:W	10/26/20	<0.20	<0.20	9.9	4.5
MW-42:W-2	10/26/20	<0.20	<0.20	9.8	3.3
MW-42:W-3	10/26/20	0.42	0.24	5.1	2.0
Site Specific Cleanup Level		5.0	5.0	16	0.2

Ug/L – Micrograms per liter (equivalent to parts per billion)

As noted in the table above, PCE, TCE, and (cis) 1,2-DCE were not detected above the Site-specific cleanup level during any of the three sampling methods. Vinyl chloride was the only Site contaminant of concern detected above the Site-specific cleanup level during all three of the sampling events. Complete analytical results are included as Attachment A and the laboratory analytical report is included as Attachment B.

DISCUSSION

The purpose of the pumping exercise was to demonstrate that MW-42 is hydraulically connected to, and therefore analytical data representative, of the former deep groundwater monitoring well MW-9. Survey data for MW-42 and MW-9 along with the depths of well screens are depicted in Table 3 below:

Table 3
Well Screen Elevations

Well ID	Top of Well Casing Elevation (Feet AMSL)	Total Well Depth (Feet)	Bottom of Well Elevation (Feet AMSL)	Screen Length (Feet)	Top of Well Screen Elevation (Feet AMSL)
MW-9	49.857	50.340	-0.483	5	4.517
MW-42	48.354	44.85	3.504	15	18.504

Well survey completed using NAVD88 datum
 AMSL – Above mean sea level

As noted above, the top of the well screen at MW-9 was located at 4.517 feet above mean sea level (AMSL) and the bottom of the well screen at MW-42 is 3.504 feet AMSL. The well screens at MW-9 and MW-42 are hydraulically connected within a 1-foot screen interval and groundwater samples collected from MW-42 are representative of the deep aquifer.

Furthermore, during the variable pumping tests on October 26, 2020, 0.01 feet to 0.30 feet of drawdown was observed at MW-43 during the three pumping rates at MW-42. MW-43 is located 10 feet cross-gradient from MW-42, which means that the radius of influence extends a minimum of 10 lateral feet. MW-42 is located approximately 10 to 15 feet down-gradient of the former location of MW-9, so the radius of influence extends to the former radius of influence of MW-9.

The analytical results from the October 26, 2020 sampling event remained relatively consistent throughout all three pumping rates. No concentrations of PCE, TCE, or (cis) 1,2-DCE were detected above their respective Site-specific cleanup levels. PCE was only detected during the submersible pump sampling at a concentration of 0.42 micrograms per liter (ug/L), well below the Site-specific cleanup level of 5.0 ug/L. Additionally, PCE was not detected at MW-42 during any of the previous sampling events at the Site, spanning from January 2019 to July 2020. Given the lateral position of MW-42 located 10 to 15 feet down-gradient of MW-9 and the hydraulically connected well screens, if there was any residual PCE contaminated groundwater in the deeper aquifer in the area of MW-9, there would have been PCE concentrations detected at MW-42 over the past 2 years.

The sampling regime scope of work confirms that groundwater samples collected from MW-42 are representative of groundwater conditions at MW-9.

FIGURES

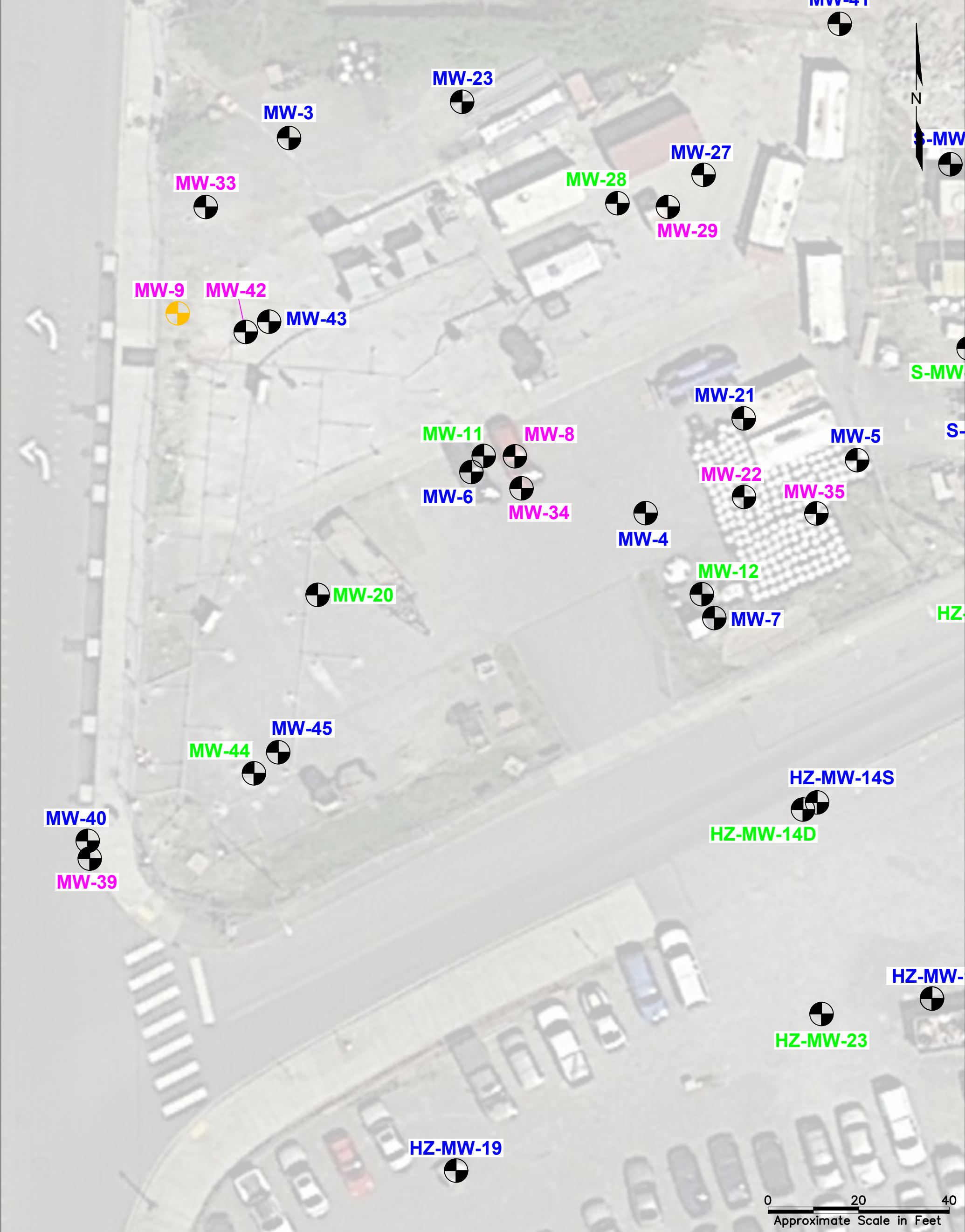
Figure 1 – Site Plan

ATTACHMENTS

Attachment A – October 2020 Groundwater Analytical Results

Attachment B – Analytical Laboratory Reports

FIGURES



LEGEND

- MW-1 Location of shallow monitoring well (screened 5-25 ft bgs)
- MW-2 Location of intermediate monitoring well (screened 25-35 ft bgs)
- MW-3 Location of deep monitoring well (screened 35-55 ft bgs)
- MW-9 Location of decommissioned deep monitoring well (screened 35-55 ft bgs)

ATTACHMENT A
OCTOBER 2020 GROUNDWATER ANALYTICAL RESULTS

**Attachment A
Bothell Service Center Simon Son
October 2020 Groundwater Analytical Results**

Well	Well Type and Water Bearing Zone	Screened Depth, (ft bgs)	Top of Casing (TOC) Elevation (feet)*	Date Sampled	Sample ID	PCE (µg/L)	TCE (µg/L)	(cis) 1,2-DCE (µg/L)	Vinyl Chloride (µg/L)	pH (units)	Temp (°C)	Conductivity (µS)	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (mV)	Dissolved Iron (ug/L)	Sulfate (mg/L)	Chloride (mg/L)	Ammonia as N (mg/L)	Methane (mg/L)	Ethane (mg/L)	Ethene (mg/L)	Total Organic Carbon (mg/L)	
MW-42	Deep	30 to 45	48.354	10/26/20	MW-42:W	<0.20	<0.20	9.9	4.5	6.18	15.6	549.0	0.25	-57.1	32,000	<5.0	14	0.39	7.3	<0.00022	0.0082	32	
				10/26/20	MW-42:W-2	<0.20	<0.20	9.8	3.3	6.11	16.3	663.0	0.21	-60.5	43,000	<5.0	15	0.38	6.0	<0.00022	0.013	46	
				10/26/20	MW-42:W-3	0.42	0.24	5.1	2.0	6.10	16.3	623.0	0.14	-55.8	43,000	<5.0	14	0.36	14	<0.00022	0.014	31	
MTCA Method A Cleanup Level ¹						5.0	5.0		0.2														
MTCA Method B Cleanup Level ²								16															

Notes:

PCE – Tetrachloroethene

TCE – Trichloroethene

1,1-DCE - 1,1-Dichloroethene

(cis) 1,2-DCE - (cis) 1,2-Dichloroethene

Blank – Not analyzed or not available

Bold – Analyte detected

Bold / highlighted – Analyte exceeds MTCA A/B cleanup level

Italicized - Detection limit exceeds respective cleanup level

< – Analyte not detected at listed reporting limit

mg/L – micrograms per liter

MV – Millivolts

ES – Estimated concentration because analyte concentration was outside of lab instrument calibration range

DNAPL – Dense Non-Aqueous Phase Liquid

1 – Table 720-1, WAC 173-340-900

2 – WA Dept. of Ecology CLARC ground water data table (<https://fortress.wa.gov/ecy/clarc/FocusSheets/Groundwater%20Methods%20B%20and%20A%20and%20ARARs.pdf>)

NA – Not Applicable

ATTACHMENT B
ANALYTICAL LABORATORY RESULTS



14648 NE 95th Street, Redmond, WA 98052 • (425) 883-3881

November 4, 2020

Jeff Jensen
Kane Environmental, Inc.
4015 13th Avenue West
Seattle, WA 98119

Re: Analytical Data for Project 82302-9.4
Laboratory Reference No. 2010-310

Dear Jeff:

Enclosed are the analytical results and associated quality control data for samples submitted on October 26, 2020.

The standard policy of OnSite Environmental, Inc. is to store your samples for 30 days from the date of receipt. If you require longer storage, please contact the laboratory.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning the data, or need additional information, please feel free to call me.

Sincerely,

A handwritten signature in black ink, appearing to read "DB", with a long horizontal stroke extending to the right.

David Baumeister
Project Manager

Enclosures



OnSite Environmental, Inc. 14648 NE 95th Street, Redmond, WA 98052 (425) 883-3881

This report pertains to the samples analyzed in accordance with the chain of custody, and is intended only for the use of the individual or company to whom it is addressed.

Date of Report: November 4, 2020
Samples Submitted: October 26, 2020
Laboratory Reference: 2010-310
Project: 82302-9.4

Case Narrative

Samples were collected on October 26, 2020 and received by the laboratory on October 26, 2020. They were maintained at the laboratory at a temperature of 2°C to 6°C.

Please note that any and all soil sample results are reported on a dry-weight basis, unless otherwise noted below.

General QA/QC issues associated with the analytical data enclosed in this laboratory report will be indicated with a reference to a comment or explanation on the Data Qualifier page. More complex and involved QA/QC issues will be discussed in detail below.



Date of Report: November 4, 2020
 Samples Submitted: October 26, 2020
 Laboratory Reference: 2010-310
 Project: 82302-9.4

VOLATILE ORGANICS EPA 8260D
 page 1 of 2

Matrix: Water
 Units: ug/L

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	MW-42:W-2					
Laboratory ID:	10-310-01					
Dichlorodifluoromethane	ND	0.27	EPA 8260D	10-28-20	10-28-20	
Chloromethane	ND	1.3	EPA 8260D	10-28-20	10-28-20	
Vinyl Chloride	3.3	0.20	EPA 8260D	10-28-20	10-28-20	
Bromomethane	ND	0.70	EPA 8260D	10-28-20	10-28-20	
Chloroethane	ND	1.0	EPA 8260D	10-28-20	10-28-20	
Trichlorofluoromethane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,1-Dichloroethene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
Iodomethane	ND	4.4	EPA 8260D	10-28-20	10-28-20	
Methylene Chloride	ND	1.0	EPA 8260D	10-28-20	10-28-20	
(trans) 1,2-Dichloroethene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,1-Dichloroethane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
2,2-Dichloropropane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
(cis) 1,2-Dichloroethene	9.8	0.20	EPA 8260D	10-28-20	10-28-20	
Bromochloromethane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
Chloroform	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,1,1-Trichloroethane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
Carbon Tetrachloride	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,1-Dichloropropene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,2-Dichloroethane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
Trichloroethene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,2-Dichloropropane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
Dibromomethane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
Bromodichloromethane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
2-Chloroethyl Vinyl Ether	ND	1.0	EPA 8260D	10-28-20	10-28-20	
(cis) 1,3-Dichloropropene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
(trans) 1,3-Dichloropropene	ND	0.20	EPA 8260D	10-28-20	10-28-20	



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VOLATILE ORGANICS EPA 8260D
 page 2 of 2

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	MW-42:W-2					
Laboratory ID:	10-310-01					
1,1,2-Trichloroethane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
Tetrachloroethene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,3-Dichloropropane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
Dibromochloromethane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,2-Dibromoethane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
Chlorobenzene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,1,1,2-Tetrachloroethane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
Bromoform	ND	1.0	EPA 8260D	10-28-20	10-28-20	
Bromobenzene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,1,2,2-Tetrachloroethane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,2,3-Trichloropropane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
2-Chlorotoluene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
4-Chlorotoluene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,3-Dichlorobenzene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,4-Dichlorobenzene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,2-Dichlorobenzene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,2-Dibromo-3-chloropropane	ND	1.0	EPA 8260D	10-28-20	10-28-20	
1,2,4-Trichlorobenzene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
Hexachlorobutadiene	ND	1.0	EPA 8260D	10-28-20	10-28-20	
1,2,3-Trichlorobenzene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
<i>Surrogate:</i>	<i>Percent Recovery</i>	<i>Control Limits</i>				
<i>Dibromofluoromethane</i>	<i>102</i>	<i>75-127</i>				
<i>Toluene-d8</i>	<i>98</i>	<i>80-127</i>				
<i>4-Bromofluorobenzene</i>	<i>101</i>	<i>78-125</i>				



Date of Report: November 4, 2020
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VOLATILE ORGANICS EPA 8260D
 page 1 of 2

Matrix: Water
 Units: ug/L

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	MW-42:W-3					
Laboratory ID:	10-310-02					
Dichlorodifluoromethane	ND	0.27	EPA 8260D	10-28-20	10-28-20	
Chloromethane	ND	1.3	EPA 8260D	10-28-20	10-28-20	
Vinyl Chloride	2.0	0.20	EPA 8260D	10-28-20	10-28-20	
Bromomethane	ND	0.70	EPA 8260D	10-28-20	10-28-20	
Chloroethane	ND	1.0	EPA 8260D	10-28-20	10-28-20	
Trichlorofluoromethane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,1-Dichloroethene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
Iodomethane	ND	4.4	EPA 8260D	10-28-20	10-28-20	
Methylene Chloride	ND	1.0	EPA 8260D	10-28-20	10-28-20	
(trans) 1,2-Dichloroethene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,1-Dichloroethane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
2,2-Dichloropropane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
(cis) 1,2-Dichloroethene	5.1	0.20	EPA 8260D	10-28-20	10-28-20	
Bromochloromethane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
Chloroform	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,1,1-Trichloroethane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
Carbon Tetrachloride	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,1-Dichloropropene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,2-Dichloroethane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
Trichloroethene	0.24	0.20	EPA 8260D	10-28-20	10-28-20	
1,2-Dichloropropane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
Dibromomethane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
Bromodichloromethane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
2-Chloroethyl Vinyl Ether	ND	1.0	EPA 8260D	10-28-20	10-28-20	
(cis) 1,3-Dichloropropene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
(trans) 1,3-Dichloropropene	ND	0.20	EPA 8260D	10-28-20	10-28-20	



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VOLATILE ORGANICS EPA 8260D
 page 2 of 2

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	MW-42:W-3					
Laboratory ID:	10-310-02					
1,1,2-Trichloroethane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
Tetrachloroethene	0.42	0.20	EPA 8260D	10-28-20	10-28-20	
1,3-Dichloropropane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
Dibromochloromethane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,2-Dibromoethane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
Chlorobenzene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,1,1,2-Tetrachloroethane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
Bromoform	ND	1.0	EPA 8260D	10-28-20	10-28-20	
Bromobenzene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,1,2,2-Tetrachloroethane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,2,3-Trichloropropane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
2-Chlorotoluene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
4-Chlorotoluene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,3-Dichlorobenzene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,4-Dichlorobenzene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,2-Dichlorobenzene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,2-Dibromo-3-chloropropane	ND	1.0	EPA 8260D	10-28-20	10-28-20	
1,2,4-Trichlorobenzene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
Hexachlorobutadiene	ND	1.0	EPA 8260D	10-28-20	10-28-20	
1,2,3-Trichlorobenzene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
<i>Surrogate:</i>	<i>Percent Recovery</i>	<i>Control Limits</i>				
<i>Dibromofluoromethane</i>	<i>104</i>	<i>75-127</i>				
<i>Toluene-d8</i>	<i>100</i>	<i>80-127</i>				
<i>4-Bromofluorobenzene</i>	<i>103</i>	<i>78-125</i>				



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 Laboratory Reference: 2010-310
 Project: 82302-9.4

VOLATILE ORGANICS EPA 8260D
 page 1 of 2

Matrix: Water
 Units: ug/L

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	MW-42:W					
Laboratory ID:	10-310-03					
Dichlorodifluoromethane	ND	0.27	EPA 8260D	10-28-20	10-28-20	
Chloromethane	ND	1.3	EPA 8260D	10-28-20	10-28-20	
Vinyl Chloride	4.5	0.20	EPA 8260D	10-28-20	10-28-20	
Bromomethane	ND	0.70	EPA 8260D	10-28-20	10-28-20	
Chloroethane	ND	1.0	EPA 8260D	10-28-20	10-28-20	
Trichlorofluoromethane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,1-Dichloroethene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
Iodomethane	ND	4.4	EPA 8260D	10-28-20	10-28-20	
Methylene Chloride	ND	1.0	EPA 8260D	10-28-20	10-28-20	
(trans) 1,2-Dichloroethene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,1-Dichloroethane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
2,2-Dichloropropane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
(cis) 1,2-Dichloroethene	9.9	0.20	EPA 8260D	10-28-20	10-28-20	
Bromochloromethane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
Chloroform	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,1,1-Trichloroethane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
Carbon Tetrachloride	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,1-Dichloropropene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,2-Dichloroethane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
Trichloroethene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,2-Dichloropropane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
Dibromomethane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
Bromodichloromethane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
2-Chloroethyl Vinyl Ether	ND	1.0	EPA 8260D	10-28-20	10-28-20	
(cis) 1,3-Dichloropropene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
(trans) 1,3-Dichloropropene	ND	0.20	EPA 8260D	10-28-20	10-28-20	



Date of Report: November 4, 2020
 Samples Submitted: October 26, 2020
 Laboratory Reference: 2010-310
 Project: 82302-9.4

VOLATILE ORGANICS EPA 8260D
 page 2 of 2

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	MW-42:W					
Laboratory ID:	10-310-03					
1,1,2-Trichloroethane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
Tetrachloroethene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,3-Dichloropropane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
Dibromochloromethane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,2-Dibromoethane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
Chlorobenzene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,1,1,2-Tetrachloroethane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
Bromoform	ND	1.0	EPA 8260D	10-28-20	10-28-20	
Bromobenzene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,1,2,2-Tetrachloroethane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,2,3-Trichloropropane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
2-Chlorotoluene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
4-Chlorotoluene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,3-Dichlorobenzene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,4-Dichlorobenzene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,2-Dichlorobenzene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,2-Dibromo-3-chloropropane	ND	1.0	EPA 8260D	10-28-20	10-28-20	
1,2,4-Trichlorobenzene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
Hexachlorobutadiene	ND	1.0	EPA 8260D	10-28-20	10-28-20	
1,2,3-Trichlorobenzene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
<i>Surrogate:</i>	<i>Percent Recovery</i>	<i>Control Limits</i>				
<i>Dibromofluoromethane</i>	<i>104</i>	<i>75-127</i>				
<i>Toluene-d8</i>	<i>99</i>	<i>80-127</i>				
<i>4-Bromofluorobenzene</i>	<i>102</i>	<i>78-125</i>				



Date of Report: November 4, 2020
 Samples Submitted: October 26, 2020
 Laboratory Reference: 2010-310
 Project: 82302-9.4

VOLATILE ORGANICS EPA 8260D/SIM
QUALITY CONTROL
 page 1 of 2

Matrix: Water
 Units: ug/L

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB1028W1					
Dichlorodifluoromethane	ND	0.27	EPA 8260D	10-28-20	10-28-20	
Chloromethane	ND	1.3	EPA 8260D	10-28-20	10-28-20	
Vinyl Chloride	ND	0.020	EPA 8260D/SIM	10-28-20	10-28-20	
Bromomethane	ND	0.70	EPA 8260D	10-28-20	10-28-20	
Chloroethane	ND	1.0	EPA 8260D	10-28-20	10-28-20	
Trichlorofluoromethane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,1-Dichloroethene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
Iodomethane	ND	4.4	EPA 8260D	10-28-20	10-28-20	
Methylene Chloride	ND	1.0	EPA 8260D	10-28-20	10-28-20	
(trans) 1,2-Dichloroethene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,1-Dichloroethane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
2,2-Dichloropropane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
(cis) 1,2-Dichloroethene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
Bromochloromethane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
Chloroform	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,1,1-Trichloroethane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
Carbon Tetrachloride	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,1-Dichloropropene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,2-Dichloroethane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
Trichloroethene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,2-Dichloropropane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
Dibromomethane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
Bromodichloromethane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
2-Chloroethyl Vinyl Ether	ND	1.0	EPA 8260D	10-28-20	10-28-20	
(cis) 1,3-Dichloropropene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
(trans) 1,3-Dichloropropene	ND	0.20	EPA 8260D	10-28-20	10-28-20	



Date of Report: November 4, 2020
 Samples Submitted: October 26, 2020
 Laboratory Reference: 2010-310
 Project: 82302-9.4

VOLATILE ORGANICS EPA 8260D/SIM
QUALITY CONTROL
 page 2 of 2

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB1028W1					
1,1,2-Trichloroethane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
Tetrachloroethene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,3-Dichloropropane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
Dibromochloromethane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,2-Dibromoethane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
Chlorobenzene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,1,1,2-Tetrachloroethane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
Bromoform	ND	1.0	EPA 8260D	10-28-20	10-28-20	
Bromobenzene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,1,2,2-Tetrachloroethane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,2,3-Trichloropropane	ND	0.20	EPA 8260D	10-28-20	10-28-20	
2-Chlorotoluene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
4-Chlorotoluene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,3-Dichlorobenzene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,4-Dichlorobenzene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,2-Dichlorobenzene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
1,2-Dibromo-3-chloropropane	ND	1.0	EPA 8260D	10-28-20	10-28-20	
1,2,4-Trichlorobenzene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
Hexachlorobutadiene	ND	1.0	EPA 8260D	10-28-20	10-28-20	
1,2,3-Trichlorobenzene	ND	0.20	EPA 8260D	10-28-20	10-28-20	
<i>Surrogate:</i>	<i>Percent Recovery</i>	<i>Control Limits</i>				
<i>Dibromofluoromethane</i>	<i>103</i>	<i>75-127</i>				
<i>Toluene-d8</i>	<i>98</i>	<i>80-127</i>				
<i>4-Bromofluorobenzene</i>	<i>101</i>	<i>78-125</i>				



Date of Report: November 4, 2020
 Samples Submitted: October 26, 2020
 Laboratory Reference: 2010-310
 Project: 82302-9.4

**VOLATILE ORGANICS EPA 8260D
 QUALITY CONTROL**

Matrix: Water
 Units: ug/L

Analyte	Result		Spike Level		Percent Recovery		Recovery	RPD	RPD	Flags
					Recovery	Limits	RPD	Limit		
SPIKE BLANKS										
Laboratory ID:	SB1028W1									
	SB	SBD	SB	SBD	SB	SBD				
1,1-Dichloroethene	9.74	9.41	10.0	10.0	97	94	65-126	3	19	
Benzene	9.75	9.35	10.0	10.0	98	94	71-119	4	16	
Trichloroethene	9.60	9.59	10.0	10.0	96	96	82-123	0	18	
Toluene	9.39	9.19	10.0	10.0	94	92	77-119	2	18	
Chlorobenzene	9.48	9.29	10.0	10.0	95	93	80-120	2	17	
<i>Surrogate:</i>										
Dibromofluoromethane					102	100	75-127			
Toluene-d8					100	99	80-127			
4-Bromofluorobenzene					106	105	78-125			



Date of Report: November 4, 2020
 Samples Submitted: October 26, 2020
 Laboratory Reference: 2010-310
 Project: 82302-9.4

**TOTAL ORGANIC CARBON
 SM 5310B**

Matrix: Water
 Units: mg/L

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	MW-42:W-2					
Laboratory ID:	10-310-01					
Total Organic Carbon	46	1.0	SM 5310B	10-27-20	10-27-20	
Client ID:	MW-42:W-3					
Laboratory ID:	10-310-02					
Total Organic Carbon	31	1.0	SM 5310B	10-27-20	10-27-20	
Client ID:	MW-42:W					
Laboratory ID:	10-310-03					
Total Organic Carbon	32	1.0	SM 5310B	10-27-20	10-27-20	



Date of Report: November 4, 2020
 Samples Submitted: October 26, 2020
 Laboratory Reference: 2010-310
 Project: 82302-9.4

**TOTAL ORGANIC CARBON
 SM 5310B
 QUALITY CONTROL**

Matrix: Water
 Units: mg/L

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB1027W1					
Total Organic Carbon	ND	1.0	SM 5310B	10-27-20	10-27-20	

Analyte	Result	Spike Level	Source Result	Percent Recovery	Recovery Limits	RPD	RPD Limit	Flags
DUPLICATE								
Laboratory ID:	10-270-01							
	ORIG	DUP						
Total Organic Carbon	1.67	1.66	NA	NA	NA	NA	1	12

MATRIX SPIKE								
Laboratory ID:	10-270-01							
	MS	MS		MS				
Total Organic Carbon	11.9		10.0	1.67	102	80-124	NA	NA

SPIKE BLANK								
Laboratory ID:	SB1027W1							
	SB	SB		SB				
Total Organic Carbon	10.2		10.0	NA	102	80-124	NA	NA



Date of Report: November 4, 2020
 Samples Submitted: October 26, 2020
 Laboratory Reference: 2010-310
 Project: 82302-9.4

DISSOLVED IRON
EPA 6010D

Matrix: Water
 Units: ug/L (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	MW-42:W-2					
Laboratory ID:	10-310-01					
Iron	43000	500	EPA 6010D	10-26-20	10-30-20	

Client ID:	MW-42:W-3					
Laboratory ID:	10-310-02					
Iron	43000	500	EPA 6010D	10-26-20	10-30-20	

Client ID:	MW-42:W					
Laboratory ID:	10-310-03					
Iron	32000	500	EPA 6010D	10-26-20	10-30-20	



Date of Report: November 4, 2020
 Samples Submitted: October 26, 2020
 Laboratory Reference: 2010-310
 Project: 82302-9.4

**DISSOLVED IRON
 EPA 6010D
 QUALITY CONTROL**

Matrix: Water
 Units: ug/L (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB1026F1					
Iron	ND	56	EPA 6010D	10-26-20	10-30-20	

Analyte	Result	Spike Level	Source Result	Percent Recovery	Recovery Limits	RPD	RPD Limit	Flags
DUPLICATE								
Laboratory ID:	10-302-01							
	ORIG	DUP						
Iron	99.7	100	NA	NA	NA	1	20	

MATRIX SPIKES

Laboratory ID:	10-302-01									
	MS	MSD	MS	MSD	MS	MSD				
Iron	22700	25400	22200	22200	99.7	102	114	75-125	11	20



Date of Report: November 4, 2020
 Samples Submitted: October 26, 2020
 Laboratory Reference: 2010-310
 Project: 82302-9.4

CHLORIDE
SM 4500-Cl E

Matrix: Water
 Units: mg/L

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	MW-42:W-2					
Laboratory ID:	10-310-01					
Chloride	15	2.0	SM 4500-Cl E	10-30-20	10-30-20	

Client ID:	MW-42:W-3					
Laboratory ID:	10-310-02					
Chloride	14	2.0	SM 4500-Cl E	10-30-20	10-30-20	

Client ID:	MW-42:W					
Laboratory ID:	10-310-03					
Chloride	14	2.0	SM 4500-Cl E	10-30-20	10-30-20	



Date of Report: November 4, 2020
 Samples Submitted: October 26, 2020
 Laboratory Reference: 2010-310
 Project: 82302-9.4

**CHLORIDE
 SM 4500-Cl E
 QUALITY CONTROL**

Matrix: Water
 Units: mg/L

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB1030W1					
Chloride	ND	2.0	SM 4500-Cl E	10-30-20	10-30-20	

Analyte	Result	Spike Level	Source Result	Percent Recovery	Recovery Limits	RPD	RPD Limit	Flags
DUPLICATE								
Laboratory ID:	10-323-03							
	ORIG	DUP						
Chloride	13.3	13.4	NA	NA	NA	1	14	

MATRIX SPIKE								
Laboratory ID:	10-323-03							
	MS	MS		MS				
Chloride	58.1	50.0	13.3	90	86-110	NA	NA	

SPIKE BLANK								
Laboratory ID:	SB1030W1							
	SB	SB		SB				
Chloride	49.4	50.0	NA	99	86-110	NA	NA	



Date of Report: November 4, 2020
 Samples Submitted: October 26, 2020
 Laboratory Reference: 2010-310
 Project: 82302-9.4

AMMONIA (as Nitrogen)
SM 4500-NH₃ D

Matrix: Water
 Units: mg/L

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	MW-42:W-2					
Laboratory ID:	10-310-01					
Ammonia	0.38	0.050	SM 4500-NH3 D	10-30-20	10-30-20	

Client ID:	MW-42:W-3					
Laboratory ID:	10-310-02					
Ammonia	0.36	0.050	SM 4500-NH3 D	10-30-20	10-30-20	

Client ID:	MW-42:W					
Laboratory ID:	10-310-03					
Ammonia	0.39	0.050	SM 4500-NH3 D	10-30-20	10-30-20	



Date of Report: November 4, 2020
 Samples Submitted: October 26, 2020
 Laboratory Reference: 2010-310
 Project: 82302-9.4

**AMMONIA (as Nitrogen)
 SM 4500-NH₃ D
 QUALITY CONTROL**

Matrix: Water
 Units: mg/L

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB1030W1					
Ammonia	ND	0.050	SM 4500-NH3 D	10-30-20	10-30-20	

Analyte	Result	Spike Level	Source Result	Percent Recovery	Recovery Limits	RPD	RPD Limit	Flags
DUPLICATE								
Laboratory ID:	10-302-04							
	ORIG	DUP						
Ammonia	ND	ND	NA	NA	NA	NA	11	

MATRIX SPIKE								
Laboratory ID:	10-302-04							
	MS	MS		MS				
Ammonia	5.13	5.00	ND	103	76-118	NA	NA	

SPIKE BLANK								
Laboratory ID:	SB1030W1							
	SB	SB		SB				
Ammonia	5.15	5.00	NA	103	88-110	NA	NA	



Date of Report: November 4, 2020
 Samples Submitted: October 26, 2020
 Laboratory Reference: 2010-310
 Project: 82302-9.4

SULFATE
ASTM D516-11

Matrix: Water
 Units: mg/L

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	MW-42:W-2					
Laboratory ID:	10-310-01					
Sulfate	ND	5.0	ASTM D516-11	10-28-20	10-28-20	

Client ID:	MW-42:W-3					
Laboratory ID:	10-310-02					
Sulfate	ND	5.0	ASTM D516-11	10-28-20	10-28-20	

Client ID:	MW-42:W					
Laboratory ID:	10-310-03					
Sulfate	ND	5.0	ASTM D516-11	10-28-20	10-28-20	



Date of Report: November 4, 2020
 Samples Submitted: October 26, 2020
 Laboratory Reference: 2010-310
 Project: 82302-9.4

**SULFATE
 ASTM D516-11
 QUALITY CONTROL**

Matrix: Water
 Units: mg/L

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB1028W1					
Sulfate	ND	5.0	ASTM D516-11	10-28-20	10-28-20	

Analyte	Result	Spike Level	Source Result	Percent Recovery	Recovery Limits	RPD	RPD Limit	Flags
DUPLICATE								
Laboratory ID:	10-286-01							
	ORIG	DUP						
Sulfate	15.5	15.9	NA	NA	NA	3	11	

MATRIX SPIKE								
Laboratory ID:	10-286-01							
	MS	MS		MS				
Sulfate	37.1	20.0	15.5	108	61-148	NA	NA	

SPIKE BLANK								
Laboratory ID:	SB1028W1							
	SB	SB		SB				
Sulfate	10.6	10.0	NA	106	86-116	NA	NA	



Date of Report: November 4, 2020
 Samples Submitted: October 26, 2020
 Laboratory Reference: 2010-310
 Project: 82302-9.4

**DISSOLVED GASES
 RSK 175**

Matrix: Water
 Units: ug/L (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	MW-42:W-2					
Laboratory ID:	10-310-01					
Methane	6000	83	RSK 175	11-2-20	11-2-20	
Ethane	ND	0.22	RSK 175	11-2-20	11-2-20	
Ethene	13	0.29	RSK 175	11-2-20	11-2-20	

Client ID:	MW-42:W-3					
Laboratory ID:	10-310-02					
Methane	14000	110	RSK 175	11-2-20	11-2-20	
Ethane	ND	0.22	RSK 175	11-2-20	11-2-20	
Ethene	14	0.29	RSK 175	11-2-20	11-2-20	

Client ID:	MW-42:W					
Laboratory ID:	10-310-03					
Methane	7300	55	RSK 175	11-2-20	11-2-20	
Ethane	ND	0.22	RSK 175	11-2-20	11-2-20	
Ethene	8.2	0.29	RSK 175	11-2-20	11-2-20	



Date of Report: November 4, 2020
 Samples Submitted: October 26, 2020
 Laboratory Reference: 2010-310
 Project: 82302-9.4

**DISSOLVED GASES
 RSK 175
 QUALITY CONTROL**

Matrix: Water
 Units: ug/L (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB1102W1					
Methane	ND	0.55	RSK 175	11-2-20	11-2-20	
Ethane	ND	0.22	RSK 175	11-2-20	11-2-20	
Ethene	ND	0.29	RSK 175	11-2-20	11-2-20	

Analyte	Result		Spike Level		Percent Recovery		Recovery Limits	RPD	RPD Limit	Flags
SPIKE BLANK										
Laboratory ID:	SB1102W1									
	SB	SBD	SB	SBD	SB	SBD				
Methane	19.5	19.8	22.1	22.1	88	90	75-125	2	25	
Ethane	35.2	36.6	41.6	41.6	85	88	75-125	4	25	
Ethene	36.5	38.9	38.8	38.8	94	100	75-125	6	25	





Data Qualifiers and Abbreviations

- A - Due to a high sample concentration, the amount spiked is insufficient for meaningful MS/MSD recovery data.
 - B - The analyte indicated was also found in the blank sample.
 - C - The duplicate RPD is outside control limits due to high result variability when analyte concentrations are within five times the quantitation limit.
 - E - The value reported exceeds the quantitation range and is an estimate.
 - F - Surrogate recovery data is not available due to the high concentration of coeluting target compounds.
 - H - The analyte indicated is a common laboratory solvent and may have been introduced during sample preparation, and be impacting the sample result.
 - I - Compound recovery is outside of the control limits.
 - J - The value reported was below the practical quantitation limit. The value is an estimate.
 - K - Sample duplicate RPD is outside control limits due to sample inhomogeneity. The sample was re-extracted and re-analyzed with similar results.
 - L - The RPD is outside of the control limits.
 - M - Hydrocarbons in the gasoline range are impacting the diesel range result.
 - M1 - Hydrocarbons in the gasoline range (toluene-naphthalene) are present in the sample.
 - N - Hydrocarbons in the lube oil range are impacting the diesel range result.
 - N1 - Hydrocarbons in diesel range are impacting lube oil range results.
 - O - Hydrocarbons indicative of heavier fuels are present in the sample and are impacting the gasoline result.
 - P - The RPD of the detected concentrations between the two columns is greater than 40.
 - Q - Surrogate recovery is outside of the control limits.
 - S - Surrogate recovery data is not available due to the necessary dilution of the sample.
 - T - The sample chromatogram is not similar to a typical _____.
 - U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
 - U1 - The practical quantitation limit is elevated due to interferences present in the sample.
 - V - Matrix Spike/Matrix Spike Duplicate recoveries are outside control limits due to matrix effects.
 - W - Matrix Spike/Matrix Spike Duplicate RPD are outside control limits due to matrix effects.
 - X - Sample extract treated with a mercury cleanup procedure.
 - X1 - Sample extract treated with a sulfuric acid/silica gel cleanup procedure.
 - Y - The calibration verification for this analyte exceeded the 20% drift specified in methods 8260 & 8270, and therefore the reported result should be considered an estimate. The overall performance of the calibration verification standard met the acceptance criteria of the method.
 - Z -
- ND - Not Detected at PQL
 PQL - Practical Quantitation Limit
 RPD - Relative Percent Difference





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Chain of Custody

Turnaround Request
(in working days)
(Check One)

Same Day 1 Day

2 Days *Guess* 3 Days

Standard (7 Days)

_____ (other)

Laboratory Number: **10-310**

Company: **Kane Environmental**
Project Number: **82302-9.4**
Project Name: **Bothell BSCSS**
Project Manager: **Jeff Jensen**
Sampled by: **Jeff Jensen**

Lab ID	Sample Identification	Date Sampled	Time Sampled	Matrix	Number of Containers
1	MW-42:W-2	10/26	1135	GW	9
2	MW-42:W-3	10/26	1250	GW	9
3	MW-42:W	10/26	1020	GW	9

Lab ID	Sample Identification	Date	Time	Matrix	Number of Containers	NWTPH-HCID	NWTPH-Gx/BTEX	NWTPH-Gx	NWTPH-Dx (<input type="checkbox"/> Acid / SG Clean-up)	Volatiles 8260C	Halogenated Volatiles 8260C	EDB EPA 8011 (Waters Only)	Semivolatiles 8270D/SIM (with low-level PAHs)	PAHs 8270D/SIM (low-level)	PCBs 8082A	Organochlorine Pesticides 8081B	Organophosphorus Pesticides 8270D/SIM	Chlorinated Acid Herbicides 8151A	Total RCRA Metals	Total MTCA Metals	TCLP Metals	HEM (oil and grease) 1064A	Dissolved Iron	TOC	Chloride	Ammonia-N	Sulfate	% Moisture	
1	MW-42:W-2	10/26	1430	GW	9						X												X	X	X	X	X	X	
2	MW-42:W-3	10/26	1430	GW	9						X												X	X	X	X	X	X	
3	MW-42:W	10/26	1430	GW	9						X												X	X	X	X	X	X	

Signature	Company	Date	Time	Comments/Special Instructions
<i>[Signature]</i>	Kane Environmental	10/26/10	1430	low filter RSK = methane, ethane, ethene Low detection limit (3-4 µg/L)
<i>[Signature]</i>	Kane Environmental	10/26/10	1430	low detection limit for VC
<i>[Signature]</i>	Kane Environmental	10/26/10	1430	low detection limit for VC

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Reviewed/Date _____

Data Package: Standard Level III Level IV

Chromatograms with final report Electronic Data Deliverables (EDDs)