MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

INTEROFFICE COMMUNICATION

TO: Mike Jury, Project Manager, Saginaw Bay District Office
Remediation and Redevelopment Division

FROM: Jeff Pincumbe, Geologist, Geological Services Section
Remediation and Redevelopment Division

DATE: February 20, 2019

SUBJECT: F-41 PFC Contamination, Oscoda County, Site ID #35000153
Groundwater Sampling-December 2018, GSS Job #757

This data package is for Part 201 work requested by the Department of Environmental Quality (DEQ), Remediation and Redevelopment Division's (RRD's), Saginaw Bay District office for the subject site located in Oscoda County, Michigan. On December 3, 2018, RRD's Geological Services Section (GSS) collected groundwater samples from one location (CR-B-2) using a Geoprobe (Fig 1) (Appendix A). A sample was submitted to the DEQ Laboratory and analyzed for volatile organic compounds (VOCs) and metals. A sample was also collected and submitted to Vista Analytical Laboratory and analyzed for Per- and polyfluoroalkyl substances (PFAS). GSS received the final laboratory results on December 28, 2019.

The data package includes the following:

- Site Map (Fig 1)
- DEQ Laboratory Tables with Comparison Risk-Based Screening Levels (RBSLs) (Table 1 and Table 2)
- DEQ Boring Log (Appendix A)
- DEQ Laboratory Results (Appendix B)
- VISTA Laboratory Results (Appendix C)

There were no VOCs detected in the groundwater sample from CR-B-2 (Table 1). Metals were detected in the sample from CR-B-2 with arsenic, chromium, and lead exceeding at least one RBSL (Table 2) (Appendix B).

The current PFAS analyses consist of 24 compounds with two being compounds of concern: Perfluorooctane Sulfonate (PFOS) and Perfluorooctanoic Acid (PFOA). The action level for the compounds of concern is 70 parts per trillion (ng/l) for each compound or for a total of the two compounds added together. PFOS was detected at a concentration of 3.47 ng/l in the sample from CR-B-2 and PFOA was detected at a concentration of 5.28 ng/l (Appendix C).

If you have any questions, contact me at 517-243-3171. Jeff Pincumbe (KZ)

Attachments

cc: Burrell P. Shirey, DEQ

LEGEND

- Soil Boring / Monitor Well Location

- DATUM - NAD83
- PROJECTION: ESRI
- NORTHING AND EASTING COORDINATES (IN METERS) ARE IN CORNERS OF MAP

AERIAL PHOTO SOURCE: MI CENTER FOR SHARED SOLUTIONS
AERIAL PHOTO DATE: 2010
AERIAL RESOLUTION: 1 foot Natural Color

N
W E
S

0 30 60 120 Meters

0 130 260 520 Feet

1 inch = 500 feet

Wurtsmith - F41
Colbath Road - Alexander Road
ERNIE ID 35000153
OSCODA TOWNSHIP, IOSCO COUNTY
T24NS R9E SECTIONS 7 & 18

SITE MAP

GEOLOGIST
Jeff Pincumbe
Geological Services Section
Remediation and Redevelopment Division

CREATION DATE
December 2018

FIGURE 1

Michigan Department of Environmental Quality Analytical Testing Report

Work Order:	1812040
Report Date:	12/28/2018 14:33
Client:	MDEQ-RRD-SAGINAW BAY
Attention:	Mike Jury
Project Name:	F-41 PFC CONTAMINATION
Project Number:	35000153

Sample Number								1812040-01
Sample ID			Target Detection Limit (TDL)	Drinking Water Criteria (DWC)	Groundwater Surface Water Interface Criteria (GSIC)	Groundwater Volatilization to Indoor Air Inhalation Criteria (GVIIC)	Rule 57 Final Acute Value (FAV)	CR-B-2
Sample Depth								
Date Collected								12/3/2018
Date Received								12/5/2018
Analyte	Units	Method	Organics-Volatiles					
1,1,1,2-Tetrachloroethane	ug/L	8260	1	77	ID	15,000	ID	<1
1,1,1-Trichloroethane	ug/L	8260	1	200	89	660,000	1,600	<1
1,1,2,2-Tetrachloroethane	ug/L	8260	1	9	78	12,000	1,800	<1
1,1,2-Trichloroethane	ug/L	8260	1	5	330	17,000	6,400	<1
1,1-Dichloroethane	ug/L	8260	1	880	740	1,000,000	13,000	<1
1,1-Dichloroethylene	ug/L	8260	1	7	130	200	2,300	<1
1,2,3-Trichlorobenzene	ug/L	8260	NA	NA	NA	NA	NA	<5
1,2,3-Trichloropropane	ug/L	8260	1	42	NA	8,300	NA	<1
1,2,3-Trimethylbenzene	ug/L	8260	NA	NA	NA	NA	NA	<1
1,2,4-Trichlorobenzene	ug/L	8260	5	70	99	300,000	850	<5
1,2,4-Trimethylbenzene	ug/L	8260	1	63	17	56,000	310	<1
1,2-Dibromoethane	ug/L	8260	0	0	6	2,400	280	<1
1,2-Dichlorobenzene	ug/L	8260	1	600	13	160,000	240	<1
1,2-Dichloroethane	ug/L	8260	1	5	360	9,600	16,000	<1
1,2-Dichloropropane	ug/L	8260	1	5	230	16,000	4,000	<1
1,3,5-Trimethylbenzene	ug/L	8260	1	72	45	61,000	810	<1
1,3-Dichlorobenzene	ug/L	8260	1	7	28	18,000	200	<1
1,4-Dichlorobenzene	ug/L	8260	1	75	17	16,000	210	<1
2,2,4-Trimethylpentane	ug/L	8260	50	ID	NA	2,300	NA	<5
2-Butanone (MEK)	ug/L	8260	25	13,000	2,200	240,000,000	40,000	<5
2-Methylnaphthalene	ug/L	8260	5	260	19	25,000	340	<5
2-Propanone (acetone)	ug/L	8260	50	730	1,700	1,000,000,000	30,000	<20
4-Methyl-2-pentanone (MIBK)	ug/L	8260	50	1,800	ID	20,000,000	ID	<5
Acrylonitrile	ug/L	8260	2	3	2	34,000	1,200	<5
Benzene	ug/L	8260	1	5	200	5,600	1,900	<1
Bromochloromethane	ug/L	8260	NA	NA	NA	NA	NA	<1
Bromodichloromethane	ug/L	8260	1	80	ID	4,800	ID	<1
Bromoform	ug/L	8260	1	80	ID	470,000	ID	<1
Bromomethane	ug/L	8260	5	10	35	4,000	640	<5
Carbon disulfide	ug/L	8260	5	800	ID	250,000	ID	<1
Carbon tetrachloride	ug/L	8260	1	5	45	370	1,400	<1
Chlorobenzene	ug/L	8260	1	100	25	210,000	450	<1
Chloroethane	ug/L	8260	5	430	1,100	5,700,000	20,000	<5
Chloroform	ug/L	8260	1	80	350	28,000	11,000	<1
Chloromethane	ug/L	8260	5	260	ID	8,600	ID	<5
cis-1,2-Dichloroethylene	ug/L	8260	1	70	620	93,000	11,000	<1
cis-1,3-Dichloropropylene	ug/L	8260	NA	NA	NA	NA	NA	<1
Cyclohexane	ug/L	8260	NA	NA	NA	NA	NA	<5
Dibromochloromethane	ug/L	8260	5	80	ID	14,000	ID	<1
Dibromomethane	ug/L	8260	5	80	NA	ID	NA	<1
Dichlorodifluoromethane	ug/L	8260	5	1,700	ID	220,000	ID	<5
Diethyl ether	ug/L	8260	10	10	ID	61,000,000	ID	<5
Diisopropyl Ether	ug/L	8260	5	30	ID	8,000	ID	<5
Ethylbenzene	ug/L	8260	1	74	18	110,000	320	<1
Ethyltertiarybutylether	ug/L	8260	5	49	ID	2,900,000	ID	<5
Hexachloroethane	ug/L	8260	5	7	7	27,000	210	<5
Hexane	ug/L	8260	NA	3,000	NA	12,000	NA	<1
Isopropylbenzene	ug/L	8260	5	800	28	56,000	500	<1
m & p - Xylene	ug/L	8260	NA	NA	NA	NA	NA	<2
Methylene chloride	ug/L	8260	5	5	1,500	220,000	17,000	<5
Methyltertiarybutylether	ug/L	8260	5	40	7,100	47,000,000	420,000	<1
Naphthalene	ug/L	8260	5	520	11	31,000	200	<5
n-Butylbenzene	ug/L	8260	1	80	ID	ID	ID	<1
n-Propylbenzene	ug/L	8260	1	80	ID	ID	ID	<1
o-Xylene	ug/L	8260	NA	NA	NA	NA	NA	<1
sec-Butylbenzene	ug/L	8260	1	80	ID	ID	ID	<1
Styrene	ug/L	8260	1	100	80	170,000	2,900	<1
tert-Butylbenzene	ug/L	8260	1	80	ID	ID	ID	<1
tertiary Butyl Alcohol	ug/L	8260	50	3,900	NA	1,000,000,000	NA	<50
tertiaryAmylmethylether	ug/L	8260	5	190	NA	260,000	NA	<5
Tetrachloroethylene	ug/L	8260	1	5	60	25,000	2,900	<1
Tetrahydrofuran	ug/L	8260	90	95	11,000	6,900,000	150,000	<5
Toluene	ug/L	8260	1	790	270	530,000	2,600	<1
trans-1,2-Dichloroethylene	ug/L	8260	1	100	1,500	85,000	28,000	<1
trans-1,3-Dichloropropylene	ug/L	8260	NA	NA	NA	NA	NA	<1
Trichloroethylene	ug/L	8260	1	5	200	2,200	3,500	<1
Trichlorofluoromethane	ug/L	8260	1	2,600	NA	1,100,000	NA	<1
Vinyl chloride	ug/L	8260	1	2	13	1,100	17,000	<1

Grey indicates contaminant was detected.
Yellow indicates contaminant exceeds DWC.
Blue indicates contaminant exceeds GSIC.
Green indicates contaminant exceeds both DWC and GSIC.
Orange indicates contaminant exceeds one or more criteria; GVIIC and/or FAV.
"ID" means insufficient data to develop criterion.
"NA" means a criterion or value is not available or, in the case of background, not applicable.
"NLV" means hazardous substance is not likely to volatilize under most conditions.
Letters in criteria columns refer to Footnotes of the Criteria/RBSLs tables.

Michigan Department of Environmental Quality Analytical Testing Report

Table #2

Work Order: 1812040
Report Date: 12/28/2018 14:33
Client: MDEQ-RRD-SAGINAW BAY
Attention: Mike Jury
Project Name: F-41 PFC CONTAMINATION
Project Number: 35000153

Sample Number			Target Detection Limit (TDL)	Drinking Water Criteria (DWC)	Groundwater Surface Water Interface Criteria (GSIC)	Groundwater Volatilization to Indoor Air Inhalation Criteria (GVIIC)	Rule 57 Final Acute Value (FAV)	1812040-01
Sample ID								CR-B-2
Sample Depth								
Date Collected								12/3/2018
Date Received								12/5/2018
Analyte	Units	Method	Inorganics-Metals					
Arsenic	ug/L	200.8	5	10	10	NLV	680	**12**
Barium	ug/L	200.8	100	2,000	G	NLV	Calc	**100**
Cadmium	ug/L	200.8	1	5	G,X	NLV	Calc	**1.3**
Chromium	ug/L	200.8	10	100	11	NLV	32	**89**
Copper	ug/L	200.8	4	1,000	G	NLV	Calc	**76**
Lead	ug/L	200.8	3	4	G,X	NLV	Calc	**16**
Mercury	ug/L	245.1	0	2	0	56	3	<0.2
Selenium	ug/L	200.8	5	50	5	NLV	120	<1
Silver	ug/L	200.8	0	34	0	NLV	1	<0.2
Zinc	ug/L	200.8	50	2,400	G	NLV	Calc	**320**

Grey indicates contaminant was detected.
Yellow indicates contaminant exceeds DWC.
Blue indicates contaminant exceeds GSIC.
Green indicates contaminant exceeds both DWC and GSIC.
Orange indicates contaminant exceeds one or more criteria; GVIIC and/or FAV.
"Calc" means the FAV must be calculated, see Rule 57 Table.
"ID" means insufficient data to develop criterion.
"NA" means a criterion or value is not available or, in the case of background, not applicable.
"NLV" means hazardous substance is not likely to volatilize under most conditions.
"G" refers to Footnote G of the Criteria/RBSLs tables. The GSI criteria must be calculated.
Letters in criteria columns refer to Footnotes of the Criteria/RBSLs tables.

APPENDIX A

F-41 PFC Contamination, Oscoda County
Site ID #35000153

DEQ Boring Log

DEQ Remediation and Redevelopment Division

BOREHOLE LOG

BORING/WELL: CR-B-2

SITE: Wurtsmith - Colbath Road

COUNTY: Iosco
TOWNSHIP: Oscoda
TOWN: T24N
RANGE: R9E
SECTION: 18
LOCATION DESCRIPTION: North of Colbath road on east side of F-41

DATE: 12-3-18
DRILLER: Scott Densteadt
GEOLOGIST: Jeff Pincumbe
DRILL METHOD: Geoprobe
TOTAL DEPTH: 18 ft
ERNIE#: 35000153

WELL CONSTRUCTION	LITHOLOGIC LOG	DESCRIPTION	DEPTH	SAMPLE ID	SAMPLE TYPE	FIELD SCREENING RESULTS	PID ppm 0 1000
		Grd.	0				
		No soil samples collected. Groundwater sample only from 14 to 18 feet.	5				
			10				
			15				
		E.O.B.	20				
			25				
			30				

VERTICAL DATUM: NA
GRD. ELEVATION: NA
T.O.C.: NA
S.W.L.: 11 ft
CASING: NA
SCREEN: NA
WELL DEPTH: NA
COMPLETION NOTES: Back filled with bentonite

LATITUDE: 44.483429106
LONGITUDE: -83.396201791
DATUM: MichGeoref
NORTHING: 440171.440
EASTING: 706877.859

APPENDIX B

F-41 PFC Contamination, Oscoda County
Site ID #35000153

DEQ Laboratory Results

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
ENVIRONMENTAL LABORATORY

P.O. Box 30270
Lansing, MI 48909
TEL: (517) 335-9800
FAX: (517) 335-9600

28 December 2018

Work Order: 1812040

Price: $246.00

Mike Jury
MDEQ-RRD-SAGINAW BAY
401 Ketchum St., Suite B
Bay City, MI 48708
RE: F-41 PFC CONTAMINATION

I certify that the analyses performed by the MDEQ Environmental Laboratory were conducted by methods approved by the U.S. Environmental Protection Agency and other appropriate regulatory agencies.

Sincerely,

Kirby Shane
Laboratory Director

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY

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MDEQ-RRD-SAGINAW BAY	Project: F-41 PFC CONTAMINATION	
401 Ketchum St., Suite B	Site Code: 35000153	**Reported:**
Bay City MI, 48708	Project Manager: Mike Jury	12/28/2018

Analytical Report for Samples

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received	Qualifier
CR-B-2	1812040-01	Water	12/03/2018	12/05/2018	

Notes and Definitions

X	Methods 8260 & 624 are used to analyze volatile organics that have boiling points below 200 °C. 2-Methylnaphthalene & naphthalene have boiling points above 200 °C and are better suited to analysis by methods 8270 & 625 as semivolatile organics.
A10	Result and reporting limit are estimated due to low initial verification standard criteria failure.
A07	Result(s) and reporting limit(s) are estimated due to poor precision.
A03	Result(s) and reporting limit(s) are estimated due to low matrix spike recovery.
ND	Indicates compound analyzed for but not detected
RL	Reporting Limit
NA	Not Applicable

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Lansing, MI 48909
TEL: (517) 335-9800
FAX: (517) 335-9600

Client ID: CR-B-2

Lab ID: 1812040-01

CAS #	Analyte	Result	RL	Units	Dilution	Analyzed Date	QC Batch	Method	Qualifier
Organics-Volatiles									
630-20-6	1,1,1,2-Tetrachloroethane	ND	1.0	ug/L	1	12/06/18	B8L0602	8260	
71-55-6	1,1,1-Trichloroethane	ND	1.0	ug/L	1	12/06/18	B8L0602	8260	
79-34-5	1,1,2,2-Tetrachloroethane	ND	1.0	ug/L	1	12/06/18	B8L0602	8260	
79-00-5	1,1,2-Trichloroethane	ND	1.0	ug/L	1	12/06/18	B8L0602	8260	
75-34-3	1,1-Dichloroethane	ND	1.0	ug/L	1	12/06/18	B8L0602	8260	
75-35-4	1,1-Dichloroethylene	ND	1.0	ug/L	1	12/06/18	B8L0602	8260	
87-61-6	1,2,3-Trichlorobenzene	ND	5.0	ug/L	1	12/06/18	B8L0602	8260	
96-18-4	1,2,3-Trichloropropane	ND	1.0	ug/L	1	12/06/18	B8L0602	8260	A10
526-73-8	1,2,3-Trimethylbenzene	ND	1.0	ug/L	1	12/06/18	B8L0602	8260	
120-82-1	1,2,4-Trichlorobenzene	ND	5.0	ug/L	1	12/06/18	B8L0602	8260	
95-63-6	1,2,4-Trimethylbenzene	ND	1.0	ug/L	1	12/06/18	B8L0602	8260	
106-93-4	1,2-Dibromoethane	ND	1.0	ug/L	1	12/06/18	B8L0602	8260	
95-50-1	1,2-Dichlorobenzene	ND	1.0	ug/L	1	12/06/18	B8L0602	8260	
107-06-2	1,2-Dichloroethane	ND	1.0	ug/L	1	12/06/18	B8L0602	8260	
78-87-5	1,2-Dichloropropane	ND	1.0	ug/L	1	12/06/18	B8L0602	8260	
108-67-8	1,3,5-Trimethylbenzene	ND	1.0	ug/L	1	12/06/18	B8L0602	8260	
541-73-1	1,3-Dichlorobenzene	ND	1.0	ug/L	1	12/06/18	B8L0602	8260	
106-46-7	1,4-Dichlorobenzene	ND	1.0	ug/L	1	12/06/18	B8L0602	8260	
540-84-1	2,2,4-Trimethylpentane	ND	5.0	ug/L	1	12/06/18	B8L0602	8260	
78-93-3	2-Butanone (MEK)	ND	5.0	ug/L	1	12/06/18	B8L0602	8260	
91-57-6	2-Methylnaphthalene	ND	5.0	ug/L	1	12/06/18	B8L0602	8260	X
67-64-1	2-Propanone (acetone)	ND	20	ug/L	1	12/06/18	B8L0602	8260	
108-10-1	4-Methyl-2-pentanone (MIBK)	ND	5.0	ug/L	1	12/06/18	B8L0602	8260	
107-13-1	Acrylonitrile	ND	5.0	ug/L	1	12/06/18	B8L0602	8260	
71-43-2	Benzene	ND	1.0	ug/L	1	12/06/18	B8L0602	8260	
74-97-5	Bromochloromethane	ND	1.0	ug/L	1	12/06/18	B8L0602	8260	
75-27-4	Bromodichloromethane	ND	1.0	ug/L	1	12/06/18	B8L0602	8260	
75-25-2	Bromoform	ND	1.0	ug/L	1	12/06/18	B8L0602	8260	
74-83-9	Bromomethane	ND	5.0	ug/L	1	12/06/18	B8L0602	8260	
75-15-0	Carbon disulfide	ND	1.0	ug/L	1	12/06/18	B8L0602	8260	
56-23-5	Carbon tetrachloride	ND	1.0	ug/L	1	12/06/18	B8L0602	8260	
108-90-7	Chlorobenzene	ND	1.0	ug/L	1	12/06/18	B8L0602	8260	
75-00-3	Chloroethane	ND	5.0	ug/L	1	12/06/18	B8L0602	8260	A07
67-66-3	Chloroform	ND	1.0	ug/L	1	12/06/18	B8L0602	8260	
74-87-3	Chloromethane	ND	5.0	ug/L	1	12/06/18	B8L0602	8260	
156-59-2	cis-1,2-Dichloroethylene	ND	1.0	ug/L	1	12/06/18	B8L0602	8260	
10061-01-5	cis-1,3-Dichloropropylene	ND	1.0	ug/L	1	12/06/18	B8L0602	8260	
110-82-7	Cyclohexane	ND	5.0	ug/L	1	12/06/18	B8L0602	8260	
124-48-1	Dibromochloromethane	ND	1.0	ug/L	1	12/06/18	B8L0602	8260	
74-95-3	Dibromomethane	ND	1.0	ug/L	1	12/06/18	B8L0602	8260	

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TEL: (517) 335-9800
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Client ID: CR-B-2

Lab ID: 1812040-01

CAS #	Analyte	Result	RL	Units	Dilution	Analyzed Date	QC Batch	Method	Qualifier
Organics-Volatiles									
75-71-8	Dichlorodifluoromethane	ND	5.0	ug/L	1	12/06/18	B8L0602	8260	
60-29-7	Diethyl ether	ND	5.0	ug/L	1	12/06/18	B8L0602	8260	
108-20-3	Diisopropyl Ether	ND	5.0	ug/L	1	12/06/18	B8L0602	8260	
100-41-4	Ethylbenzene	ND	1.0	ug/L	1	12/06/18	B8L0602	8260	
637-92-3	Ethyltertiarybutylether	ND	5.0	ug/L	1	12/06/18	B8L0602	8260	
67-72-1	Hexachloroethane	ND	5.0	ug/L	1	12/06/18	B8L0602	8260	
110-54-3	Hexane	ND	1.0	ug/L	1	12/06/18	B8L0602	8260	
98-82-8	Isopropylbenzene	ND	1.0	ug/L	1	12/06/18	B8L0602	8260	
1330-20-7	m & p - Xylene	ND	2.0	ug/L	1	12/06/18	B8L0602	8260	
75-09-2	Methylene chloride	ND	5.0	ug/L	1	12/06/18	B8L0602	8260	
1634-04-4	Methyltertiarybutylether	ND	1.0	ug/L	1	12/06/18	B8L0602	8260	
91-20-3	Naphthalene	ND	5.0	ug/L	1	12/06/18	B8L0602	8260	X
104-51-8	n-Butylbenzene	ND	1.0	ug/L	1	12/06/18	B8L0602	8260	
103-65-1	n-Propylbenzene	ND	1.0	ug/L	1	12/06/18	B8L0602	8260	
95-47-6	o-Xylene	ND	1.0	ug/L	1	12/06/18	B8L0602	8260	
135-98-8	sec-Butylbenzene	ND	1.0	ug/L	1	12/06/18	B8L0602	8260	
100-42-5	Styrene	ND	1.0	ug/L	1	12/06/18	B8L0602	8260	
98-06-6	tert-Butylbenzene	ND	1.0	ug/L	1	12/06/18	B8L0602	8260	
75-65-0	tertiary Butyl Alcohol	ND	50	ug/L	1	12/06/18	B8L0602	8260	
994-05-8	tertiaryAmylmethylether	ND	5.0	ug/L	1	12/06/18	B8L0602	8260	
127-18-4	Tetrachloroethylene	ND	1.0	ug/L	1	12/06/18	B8L0602	8260	
109-99-9	Tetrahydrofuran	ND	5.0	ug/L	1	12/06/18	B8L0602	8260	
108-88-3	Toluene	ND	1.0	ug/L	1	12/06/18	B8L0602	8260	
156-60-5	trans-1,2-Dichloroethylene	ND	1.0	ug/L	1	12/06/18	B8L0602	8260	
10061-02-6	trans-1,3-Dichloropropylene	ND	1.0	ug/L	1	12/06/18	B8L0602	8260	
79-01-6	Trichloroethylene	ND	1.0	ug/L	1	12/06/18	B8L0602	8260	
75-69-4	Trichlorofluoromethane	ND	1.0	ug/L	1	12/06/18	B8L0602	8260	
75-01-4	Vinyl chloride	ND	1.0	ug/L	1	12/06/18	B8L0602	8260	
Surrogate: Bromofluorobenzene			*104 %*	*85-115*		*12/06/18*	B8L0602	*8260*	
Surrogate: Dibromofluoromethane			*109 %*	*82.7-115*		*12/06/18*	B8L0602	*8260*	
Surrogate: Toluene-d8			*105 %*	*85-115*		*12/06/18*	B8L0602	*8260*	

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
ENVIRONMENTAL LABORATORY

P.O. Box 30270
Lansing, MI 48909
TEL: (517) 335-9800
FAX: (517) 335-9600

Client ID: CR-B-2

Lab ID: 1812040-01

CAS #	Analyte	Result	RL	Units	Dilution	Analyzed Date	QC Batch	Method	Qualifier
Inorganics-Metals									
7440-38-2	**Arsenic**	**12**	1.0	ug/L	1	12/17/18	B8L0716	200.8	
7440-39-3	**Barium**	**100**	5.0	ug/L	1	12/17/18	B8L0716	200.8	
7440-43-9	**Cadmium**	**1.3**	0.2	ug/L	1	12/17/18	B8L0716	200.8	
7440-47-3	**Chromium**	**89**	1.0	ug/L	1	12/17/18	B8L0716	200.8	
7440-50-8	**Copper**	**76**	1.0	ug/L	1	12/17/18	B8L0716	200.8	
7439-92-1	**Lead**	**16**	1.0	ug/L	1	12/17/18	B8L0716	200.8	
7439-97-6	Mercury	ND	0.2	ug/L	1	12/14/18	B8L1205	245.1	
7782-49-2	Selenium	ND	1.0	ug/L	1	12/17/18	B8L0716	200.8	
7440-22-4	Silver	ND	0.2	ug/L	1	12/17/18	B8L0716	200.8	
7440-66-6	**Zinc**	**320**	5.0	ug/L	1	12/17/18	B8L0716	200.8	

Michigan Department of Environmental Quality
Laboratory Services Section

Analysis Request Sheet

Lab Work Order Number	Project Name	Matrix
182040	F-41	WATER

Site Code/Project Number	AY	CC Email 1	Project TAT Days	Sample Collector	
		pincumbej		Jeff Pincumbe	
Dept-Division-District	Index	CC Email 2	Project Due Date	Sample Collector Phone	
RRD-Saginaw Bay		shireyb		517-243-3171	
State Project Manager	PCA	CC Email 3		Contract Firm	
Mike Jury					
State Project Manager Email	Project	Overflow Lab Choice 1	Accept Analysis hold time codes	Contract Firm Primary Contact	
Jurym1	6B22				
State Project Manager Phone	Phase	Overflow Lab Choice 2		Primary Contact Phone	
989 894 6255					

	Lab Use Only	Field Sample Identification	Collection Date	Collection Time	Container Count	Comments
1	01	CR-B-2	12-3-18			
2						
3						
4						
5						
6						
7						
8						
9						
10						

ORGANIC CHEMISTRY

VOA - Volatile Organic Acidic	
Volatiles - Full List	(1) 2 3 4 5 6 7 8 9 10
BTEX/MTBE/TMB only	1 2 3 4 5 6 7 8 9 10
Chlorinated only	1 2 3 4 5 6 7 8 9 10
GRO	1 2 3 4 5 6 7 8 9 10
1,4 Dioxane	1 2 3 4 5 6 7 8 9 10
METH - Methane, Ethane, Ethene	
Methane, Ethane, Ethene	1 2 3 4 5 6 7 8 9 10
ON - Pesticides, PCBs	
Pesticides & PCBs	1 2 3 4 5 6 7 8 9 10
Pesticides only	1 2 3 4 5 6 7 8 9 10
PCBs only	1 2 3 4 5 6 7 8 9 10
Toxaphene	1 2 3 4 5 6 7 8 9 10
Chlordane	1 2 3 4 5 6 7 8 9 10
BNA - Base Neutral Acids	
BNAs	1 2 3 4 5 6 7 8 9 10
Benzidines	1 2 3 4 5 6 7 8 9 10
PNAs only	1 2 3 4 5 6 7 8 9 10
BNs only	1 2 3 4 5 6 7 8 9 10
Acids only	1 2 3 4 5 6 7 8 9 10
Organic Specialty Requests	
Library search - Volatiles	1 2 3 4 5 6 7 8 9 10
Library search - SemiVols	1 2 3 4 5 6 7 8 9 10
Finger Print	1 2 3 4 5 6 7 8 9 10
DRO / ORO	1 2 3 4 5 6 7 8 9 10

METALS CHEMISTRY PACKAGES

OpMemo2 - Total	1 2 3 4 5 6 7 8 9 10
OpMemo2 - Dissolved	1 2 3 4 5 6 7 8 9 10
(Sb,As,Ba,Be,Cd,Cr,Cu,Co,Fe,Pb,Mn,Hg,Mo,Ni,Se,Ag,Tl,V,Zn)	
Michigan10 - Total	(2) 3 4 5 6 7 8 9 10
Michigan10 - Dissolved	1 2 3 4 5 6 7 8 9 10
(As,Ba,Cd,Cr,Cu,Pb,Hg,Se,Ag,Zn)	

MAD - DISSOLVED METALS

Diss - Silver - Ag	1 2 3 4 5 6 7 8 9 10
Diss - Aluminum - Al	1 2 3 4 5 6 7 8 9 10
Diss - Arsenic - As	1 2 3 4 5 6 7 8 9 10
Diss - Boron - B	1 2 3 4 5 6 7 8 9 10
Diss - Barium - Ba	1 2 3 4 5 6 7 8 9 10
Diss - Beryllium - Be	1 2 3 4 5 6 7 8 9 10
Diss - Cadmium - Cd	1 2 3 4 5 6 7 8 9 10
Diss - Cobalt - Co	1 2 3 4 5 6 7 8 9 10
Diss - Chromium - Cr	1 2 3 4 5 6 7 8 9 10
Diss - Copper - Cu	1 2 3 4 5 6 7 8 9 10
Diss - Iron - Fe	1 2 3 4 5 6 7 8 9 10
Diss - Mercury - Hg	1 2 3 4 5 6 7 8 9 10
Diss - Lithium - Li	1 2 3 4 5 6 7 8 9 10
Diss - Manganese - Mn	1 2 3 4 5 6 7 8 9 10
Diss - Molybdenum - Mo	1 2 3 4 5 6 7 8 9 10
Diss - Nickel - Ni	1 2 3 4 5 6 7 8 9 10
Diss - Lead - Pb	1 2 3 4 5 6 7 8 9 10
Diss - Antimony - Sb	1 2 3 4 5 6 7 8 9 10
Diss - Selenium - Se	1 2 3 4 5 6 7 8 9 10
Diss - Strontium - Sr	1 2 3 4 5 6 7 8 9 10
Diss - Titanium - Ti	1 2 3 4 5 6 7 8 9 10
Diss - Thallium - Tl	1 2 3 4 5 6 7 8 9 10
Diss - Uranium - U	1 2 3 4 5 6 7 8 9 10
Diss - Vanadium - V	1 2 3 4 5 6 7 8 9 10
Diss - Zinc - Zn	1 2 3 4 5 6 7 8 9 10
Diss - Calcium - Ca	1 2 3 4 5 6 7 8 9 10
Diss - Potassium - K	1 2 3 4 5 6 7 8 9 10
Diss - Magnesium - Mg	1 2 3 4 5 6 7 8 9 10
Diss - Sodium - Na	1 2 3 4 5 6 7 8 9 10
Diss - Hardness - Ca, Mg	1 2 3 4 5 6 7 8 9 10
MD - Metals Dissolved	
Lab Filtration	1 2 3 4 5 6 7 8 9 10

MA - TOTAL METALS

Silver - Ag	1 2 3 4 5 6 7 8 9 10
Aluminum - Al	1 2 3 4 5 6 7 8 9 10
Arsenic - As	1 2 3 4 5 6 7 8 9 10
Boron - B	1 2 3 4 5 6 7 8 9 10
Barium - Ba	1 2 3 4 5 6 7 8 9 10
Beryllium - Be	1 2 3 4 5 6 7 8 9 10
Cadmium - Cd	1 2 3 4 5 6 7 8 9 10
Cobalt - Co	1 2 3 4 5 6 7 8 9 10
Chromium - Cr	1 2 3 4 5 6 7 8 9 10
Copper - Cu	1 2 3 4 5 6 7 8 9 10
Iron - Fe	1 2 3 4 5 6 7 8 9 10
Mercury - Hg	1 2 3 4 5 6 7 8 9 10
Lithium - Li	1 2 3 4 5 6 7 8 9 10
Manganese - Mn	1 2 3 4 5 6 7 8 9 10
Molybdenum - Mo	1 2 3 4 5 6 7 8 9 10
Nickel - Ni	1 2 3 4 5 6 7 8 9 10
Lead - Pb	1 2 3 4 5 6 7 8 9 10
Antimony - Sb	1 2 3 4 5 6 7 8 9 10
Selenium - Se	1 2 3 4 5 6 7 8 9 10
Strontium - Sr	1 2 3 4 5 6 7 8 9 10
Titanium - Ti	1 2 3 4 5 6 7 8 9 10
Thallium - Tl	1 2 3 4 5 6 7 8 9 10
Uranium - U	1 2 3 4 5 6 7 8 9 10
Vanadium - V	1 2 3 4 5 6 7 8 9 10
Zinc - Zn	1 2 3 4 5 6 7 8 9 10
Calcium - Ca	1 2 3 4 5 6 7 8 9 10
Potassium - K	1 2 3 4 5 6 7 8 9 10
Magnesium - Mg	1 2 3 4 5 6 7 8 9 10
Sodium - Na	1 2 3 4 5 6 7 8 9 10
Hardness - Ca, Mg	1 2 3 4 5 6 7 8 9 10
LHG - Low Level Mercury	
Mercury Low Level - Hg	1 2 3 4 5 6 7 8 9 10

GENERAL CHEMISTRY

GB Total Cyanide - CN	1 2 3 4 5 6 7 8 9 10
GB Amenable Cyanide - CN	1 2 3 4 5 6 7 8 9 10
GCN Available Cyanide - CN	1 2 3 4 5 6 7 8 9 10
CA Chlorophyll	1 2 3 4 5 6 7 8 9 10
GN Ortho Phosphate - OP	1 2 3 4 5 6 7 8 9 10
GN Nitrite - NO_2	1 2 3 4 5 6 7 8 9 10
GN Nitrate - NO_3 (Calc.)	1 2 3 4 5 6 7 8 9 10
GN Suspended Solids - SS	1 2 3 4 5 6 7 8 9 10
GN Dissolved Solids - TDS	1 2 3 4 5 6 7 8 9 10
MN Diss Solids - TDS (Calc.)	1 2 3 4 5 6 7 8 9 10
GN Turbidity	1 2 3 4 5 6 7 8 9 10
MN Total Alkalinity	1 2 3 4 5 6 7 8 9 10
MN Bicarb/Carb Alkalinity (Includes Total Alkalinity)	1 2 3 4 5 6 7 8 9 10
MN Chloride - Cl	1 2 3 4 5 6 7 8 9 10
MN Fluoride - F	1 2 3 4 5 6 7 8 9 10
MN Sulfate - SO4	1 2 3 4 5 6 7 8 9 10
MN Chromium 6 - Cr+6	1 2 3 4 5 6 7 8 9 10
MN Conductivity	1 2 3 4 5 6 7 8 9 10
MN pH	1 2 3 4 5 6 7 8 9 10
GA Chem Oxyg Dem - COD	1 2 3 4 5 6 7 8 9 10
GA Diss Org Carbon - DOC (FF) (Field - Filtered & Preserved)	1 2 3 4 5 6 7 8 9 10
GN Diss Org Carbon - DOC (LF) (Lab - Filtered & Preserved)	1 2 3 4 5 6 7 8 9 10
GA Total Org Carbon - TOC	1 2 3 4 5 6 7 8 9 10
GA Ammonia - NH3	1 2 3 4 5 6 7 8 9 10
GA Nitrate+Nitrite - NO3+NO2	1 2 3 4 5 6 7 8 9 10
GA Kjeldahl Nitrogen - KN	1 2 3 4 5 6 7 8 9 10
GA Total Phosphorus - TP	1 2 3 4 5 6 7 8 9 10

Chain of Custody

	Relinquished by	Received By	Date / Time
Print Name & Org.	Jeff Pincumbe - MDEQ	Nicole Hagdigan	12/5/18
Signature:			1345
Print Name & Org.			
Signature:			
Print Name & Org.			
Signature:			

APPENDIX C

F-41 PFC Contamination, Oscoda County
Site ID #35000153

Vista Analytical Laboratory Results

December 28, 2018

Vista Work Order No. 1803949

Ms. Maya Murshak
Merit Laboratories, Inc.
2680 East Lansing Drive
East Lansing, MI 48823

Dear Ms. Murshak,

Enclosed are the results for the sample set received at Vista Analytical Laboratory on December 06, 2018 under your Project Name 'F-41'.

Vista Analytical Laboratory is committed to serving you effectively. If you require additional information, please contact me at 916-673-1520 or by email at mmaier@vista-analytical.com.

Thank you for choosing Vista as part of your analytical support team.

Sincerely,

Martha Maier

Martha Maier
Laboratory Director

Vista Analytical Laboratory certifies that the report herein meets all the requirements set forth by NELAP for those applicable test methods. Results relate only to the samples as received by the laboratory. This report should not be reproduced except in full without the written approval of Vista.

Vista Work Order No. 1803949
Case Narrative

Sample Condition on Receipt:

One water sample was received in good condition and within the method temperature requirements. The sample was received and stored securely in accordance with Vista standard operating procedures and EPA methodology. A sample ID discrepancy was noted between the CoC and sample container label. The client was notified and the ID has been reported as listed on the CoC.

Analytical Notes:

PFAS Isotope Dilution Method

The sample contained particulate and was centrifuged prior to extraction.

The sample was extracted and analyzed for a selected list of PFAS using the PFAS Isotope Dilution Method (Modified EPA Method 537). The results for PFHxS, PFOA, PFOS, MeFOSAA and EtFOSAA include both linear and branched isomers. Results for all other analytes include the linear isomers only.

Holding Times

The sample was extracted and analyzed within the method hold times.

Quality Control

The Initial Calibration and Continuing Calibration Verifications met the method acceptance criteria.

A Method Blank and Ongoing Precision and Recovery (OPR) sample were extracted and analyzed with the preparation batch. No analytes were detected in the Method Blank above 1/2 the LOQ. The OPR recoveries were within the method acceptance criteria.

The labeled standard recoveries outside the acceptance criteria are listed in the table below.

QC Anomalies

LabNumber	SampleName	Analysis	Analyte	Flag	%Rec
B8L0062-BLK1	B8L0062-BLK1	PFAS Isotope Dilution Method	13C2-PFDA	H	59.8
B8L0062-BS1	B8L0062-BS1	PFAS Isotope Dilution Method	13C2-PFDA	H	56.7
B8L0062-BS1	B8L0062-BS1	PFAS Isotope Dilution Method	13C2-PFUnA	H	55.6

H = Recovery was outside laboratory acceptance criteria.

TABLE OF CONTENTS

Sample Inventory Report

Vista Sample ID	Client Sample ID	Sampled	Received	Components/Containers
1803949-01	CR-B-2	03-Dec-18 00:00	06-Dec-18 11:44	HDPE Bottle, 250 mL HDPE Bottle, 250 mL

ANALYTICAL RESULTS

Sample ID: Method Blank

PFAS Isotope Dilution Method

Client Data

Name: Merit Laboratories, Inc.
Project: F-41
Matrix: Aqueous

Laboratory Data

Lab Sample: B8L0062-BLK1
Column: BEH C18

Analyte	Conc. (ng/L)	DL	LOD	LOQ	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
L-PFBA	ND	1.37	2.00	4.00		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:54	1
L-PFPeA	ND	1.37	2.00	4.00		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:54	1
L-PFBS	ND	1.37	2.00	4.00		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:54	1
L-4:2 FTS	ND	1.37	2.00	4.00		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:54	1
L-PFHxA	ND	1.37	2.00	4.00		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:54	1
L-PFPeS	ND	1.37	2.00	4.00		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:54	1
L-PFHpA	ND	1.37	2.00	4.00		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:54	1
L-PFHxS	ND	1.37	2.00	4.00		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:54	1
Br-PFHxS	ND	1.37	2.00	4.00		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:54	1
Total PFHxS	ND	1.37	2.00	4.00		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:54	1
L-6:2 FTS	ND	1.37	2.00	4.00		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:54	1
L-PFOA	ND	1.37	2.00	4.00		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:54	1
Br-PFOA	ND	1.37	2.00	4.00		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:54	1
Total PFOA	ND	1.37	2.00	4.00		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:54	1
L-PFHpS	ND	1.37	2.00	4.00		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:54	1
L-PFNA	ND	1.37	2.00	4.00		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:54	1
L-PFOSA	ND	1.37	2.00	4.00		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:54	1
L-PFOS	ND	1.37	2.00	4.00		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:54	1
Br-PFOS	ND	1.37	2.00	4.00		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:54	1
Total PFOS	ND	1.37	2.00	4.00		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:54	1
L-PFDA	ND	1.37	2.00	4.00		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:54	1
L-8:2FTS	ND	1.37	2.00	4.00		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:54	1
L-PFNS	ND	1.37	2.00	4.00		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:54	1
L-MeFOSAA	ND	1.37	2.00	4.00		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:54	1
Br-MeFOSAA	ND	1.37	2.00	4.00		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:54	1
Total MeFOSAA	ND	1.37	2.00	4.00		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:54	1
L-EtFOSAA	ND	1.37	2.00	4.00		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:54	1
Br-EtFOSAA	ND	1.37	2.00	4.00		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:54	1
Total EtFOSAA	ND	1.37	2.00	4.00		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:54	1
L-PFUnA	ND	1.37	2.00	4.00		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:54	1
L-PFDS	ND	1.37	2.00	4.00		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:54	1
L-PFDoA	ND	1.37	2.00	4.00		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:54	1
L-PFTrDA	ND	1.37	2.00	4.00		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:54	1
L-PFTeDA	ND	1.37	2.00	4.00		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:54	1

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
13C3-PFBA	IS	91.8	60 - 130		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:54	1
13C3-PFPeA	IS	84.4	60 - 150		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:54	1
13C3-PFBS	IS	84.2	60 - 150		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:54	1

Sample ID: Method Blank — **PFAS Isotope Dilution Method**

Client Data
Name: Merit Laboratories, Inc. Matrix: Aqueous
Project: F-41

Laboratory Data
Lab Sample: B8L0062-BLK1 Column: BEH C18

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
13C2-4:2 FTS	IS	78.6	40 - 150		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:54	1
13C2-PFHxA	IS	85.2	70 - 130		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:54	1
13C4-PFHpA	IS	88.8	60 - 150		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:54	1
18O2-PFHxS	IS	86.5	60 - 130		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:54	1
13C2-PFOA	IS	81.8	60 - 130		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:54	1
13C5-PFNA	IS	67.0	50 - 130		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:54	1
13C8-PFOSA	IS	41.3	20 - 150		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:54	1
13C8-PFOS	IS	74.6	60 - 130		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:54	1
13C2-PFDA	IS	59.8	60 - 130	H	B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:54	1
13C2-8:2 FTS	IS	67.0	40 - 150		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:54	1
d3-MeFOSAA	IS	68.8	50 - 150		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:54	1
d5-EtFOSAA	IS	70.1	50 - 150		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:54	1
13C2-PFUnA	IS	61.0	60 - 130		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:54	1
13C2-PFDoA	IS	60.8	30 - 130		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:54	1
13C2-PFTeDA	IS	55.9	20 - 150		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:54	1

DL - Detection Limit
LOD - Limit of Detection
LOQ - Limit of quantitation
Results reported to the DL.

Vista Analytical Laboratory

Sample ID: OPR — **PFAS Isotope Dilution Method**

Client Data

Name: Merit Laboratories, Inc.
Project: F-41
Matrix: Aqueous

Laboratory Data

Lab Sample: B8L0062-BS1
Column: BEH C18

Analyte	Amt Found (ng/L)	Spike Amt	% Rec	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
L-PFBA	36.1	40.0	90.1	70 - 130		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:43	1
L-PFPeA	37.1	40.0	92.7	70 - 130		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:43	1
L-PFBS	39.0	40.0	97.6	70 - 130		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:43	1
L-4:2 FTS	38.7	40.0	96.7	60 - 130		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:43	1
L-PFHxA	38.1	40.0	95.3	70 - 130		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:43	1
L-PFPeS	36.1	40.0	90.1	70 - 130		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:43	1
L-PFHpA	38.3	40.0	95.6	70 - 130		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:43	1
Total PFHxS	38.9	40.0	97.3	70 - 130		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:43	1
L-6:2 FTS	44.4	40.0	111	60 - 130		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:43	1
Total PFOA	33.7	40.0	84.3	70 - 130		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:43	1
L-PFHpS	41.6	40.0	104	60 - 130		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:43	1
L-PFNA	36.1	40.0	90.2	70 - 130		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:43	1
L-PFOSA	39.3	40.0	98.3	70 - 130		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:43	1
Total PFOS	36.8	40.0	92.0	70 - 130		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:43	1
L-PFDA	36.4	40.0	91.0	70 - 130		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:43	1
L-8:2FTS	38.3	40.0	95.8	60 - 130		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:43	1
L-PFNS	32.7	40.0	81.7	70 - 130		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:43	1
Total MeFOSAA	32.6	40.0	81.5	70 - 130		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:43	1
Total EtFOSAA	35.1	40.0	87.7	70 - 130		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:43	1
L-PFUnA	39.0	40.0	97.5	70 - 130		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:43	1
L-PFDS	34.0	40.0	85.1	60 - 130		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:43	1
L-PFDoA	38.6	40.0	96.5	70 - 130		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:43	1
L-PFTrDA	42.2	40.0	106	60 - 130		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:43	1
L-PFTeDA	40.1	40.0	100	70 - 130		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:43	1

Labeled Standards	Type	% Rec	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
13C3-PFBA	IS	91.9	60- 130		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:43	1
13C3-PFPeA	IS	87.6	60- 150		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:43	1
13C3-PFBS	IS	91.3	60- 150		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:43	1
13C2-4:2 FTS	IS	85.8	40- 150		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:43	1
13C2-PFHxA	IS	88.2	70- 130		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:43	1
13C4-PFHpA	IS	85.9	60- 150		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:43	1
18O2-PFHxS	IS	96.6	60- 130		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:43	1
13C2-PFOA	IS	87.7	60- 130		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:43	1
13C5-PFNA	IS	64.3	50- 130		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:43	1
13C8-PFOSA	IS	41.4	20- 150		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:43	1

Vista Analytical Laboratory

Sample ID: OPR — **PFAS Isotope Dilution Method**

Client Data

Name: Merit Laboratories, Inc.
Project: F-41
Matrix: Aqueous

Laboratory Data

Lab Sample: B8L0062-BS1
Column: BEH C18

Labeled Standards	Type	% Rec	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
13C8-PFOS	IS	78.5	60- 130		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:43	1
13C2-PFDA	IS	56.7	60- 130	H	B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:43	1
13C2-8:2 FTS	IS	76.7	40- 150		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:43	1
d3-MeFOSAA	IS	65.0	50- 150		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:43	1
d5-EtFOSAA	IS	62.0	50- 150		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:43	1
13C2-PFUnA	IS	55.6	60- 130	H	B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:43	1
13C2-PFDoA	IS	57.1	30- 130		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:43	1
13C2-PFTeDA	IS	55.8	20- 150		B8L0062	10-Dec-18	0.250 L	13-Dec-18 05:43	1

Vista Analytical Laboratory

Sample ID: CR-B-2 — **PFAS Isotope Dilution Method**

Client Data

Name: Merit Laboratories, Inc.
Project: F-41
Matrix: Water
Date Collected: 03-Dec-18 00:00

Laboratory Data

Lab Sample: 1803949-01
Date Received: 06-Dec-18 11:44
Column: BEH C18

Analyte	Conc. (ng/L)	DL	LOD	LOQ	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
L-PFBA	ND	1.37	2.00	4.01		B8L0062	10-Dec-18	0.250 L	13-Dec-18 06:15	1
L-PFPeA	ND	1.37	2.00	4.01		B8L0062	10-Dec-18	0.250 L	13-Dec-18 06:15	1
L-PFBS	ND	1.37	2.00	4.01		B8L0062	10-Dec-18	0.250 L	13-Dec-18 06:15	1
L-4:2 FTS	ND	1.37	2.00	4.01		B8L0062	10-Dec-18	0.250 L	13-Dec-18 06:15	1
L-PFHxA	ND	1.37	2.00	4.01		B8L0062	10-Dec-18	0.250 L	13-Dec-18 06:15	1
L-PFPeS	ND	1.37	2.00	4.01		B8L0062	10-Dec-18	0.250 L	13-Dec-18 06:15	1
L-PFHpA	ND	1.37	2.00	4.01		B8L0062	10-Dec-18	0.250 L	13-Dec-18 06:15	1
L-PFHxS	ND	1.37	2.00	4.01		B8L0062	10-Dec-18	0.250 L	13-Dec-18 06:15	1
Br-PFHxS	ND	1.37	2.00	4.01		B8L0062	10-Dec-18	0.250 L	13-Dec-18 06:15	1
Total PFHxS	ND	1.37	2.00	4.01		B8L0062	10-Dec-18	0.250 L	13-Dec-18 06:15	1
L-6:2 FTS	ND	1.37	2.00	4.01		B8L0062	10-Dec-18	0.250 L	13-Dec-18 06:15	1
L-PFOA	5.28	1.37	2.00	4.01		B8L0062	10-Dec-18	0.250 L	13-Dec-18 06:15	1
Br-PFOA	ND	1.37	2.00	4.01		B8L0062	10-Dec-18	0.250 L	13-Dec-18 06:15	1
Total PFOA	5.28	1.37	2.00	4.01		B8L0062	10-Dec-18	0.250 L	13-Dec-18 06:15	1
L-PFHpS	ND	1.37	2.00	4.01		B8L0062	10-Dec-18	0.250 L	13-Dec-18 06:15	1
L-PFNA	ND	1.37	2.00	4.01		B8L0062	10-Dec-18	0.250 L	13-Dec-18 06:15	1
L-PFOSA	ND	1.37	2.00	4.01		B8L0062	10-Dec-18	0.250 L	13-Dec-18 06:15	1
L-PFOS	3.47	1.37	2.00	4.01	J	B8L0062	10-Dec-18	0.250 L	13-Dec-18 06:15	1
Br-PFOS	ND	1.37	2.00	4.01		B8L0062	10-Dec-18	0.250 L	13-Dec-18 06:15	1
Total PFOS	3.47	1.37	2.00	4.01	J	B8L0062	10-Dec-18	0.250 L	13-Dec-18 06:15	1
L-PFDA	ND	1.37	2.00	4.01		B8L0062	10-Dec-18	0.250 L	13-Dec-18 06:15	1
L-8:2FTS	ND	1.37	2.00	4.01		B8L0062	10-Dec-18	0.250 L	13-Dec-18 06:15	1
L-PFNS	ND	1.37	2.00	4.01		B8L0062	10-Dec-18	0.250 L	13-Dec-18 06:15	1
L-MeFOSAA	ND	1.37	2.00	4.01		B8L0062	10-Dec-18	0.250 L	13-Dec-18 06:15	1
Br-MeFOSAA	ND	1.37	2.00	4.01		B8L0062	10-Dec-18	0.250 L	13-Dec-18 06:15	1
Total MeFOSAA	ND	1.37	2.00	4.01		B8L0062	10-Dec-18	0.250 L	13-Dec-18 06:15	1
L-EtFOSAA	ND	1.37	2.00	4.01		B8L0062	10-Dec-18	0.250 L	13-Dec-18 06:15	1
Br-EtFOSAA	ND	1.37	2.00	4.01		B8L0062	10-Dec-18	0.250 L	13-Dec-18 06:15	1
Total EtFOSAA	ND	1.37	2.00	4.01		B8L0062	10-Dec-18	0.250 L	13-Dec-18 06:15	1
L-PFUnA	ND	1.37	2.00	4.01		B8L0062	10-Dec-18	0.250 L	13-Dec-18 06:15	1
L-PFDS	ND	1.37	2.00	4.01		B8L0062	10-Dec-18	0.250 L	13-Dec-18 06:15	1
L-PFDoA	ND	1.37	2.00	4.01		B8L0062	10-Dec-18	0.250 L	13-Dec-18 06:15	1
L-PFTrDA	ND	1.37	2.00	4.01		B8L0062	10-Dec-18	0.250 L	13-Dec-18 06:15	1
L-PFTeDA	ND	1.37	2.00	4.01		B8L0062	10-Dec-18	0.250 L	13-Dec-18 06:15	1

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
13C3-PFBA	IS	90.2	60 - 130		B8L0062	10-Dec-18	0.250 L	13-Dec-18 06:15	1
13C3-PFPeA	IS	87.6	60 - 150		B8L0062	10-Dec-18	0.250 L	13-Dec-18 06:15	1
13C3-PFBS	IS	81.0	60 - 150		B8L0062	10-Dec-18	0.250 L	13-Dec-18 06:15	1

Sample ID: CR-B-2 — **PFAS Isotope Dilution Method**

Client Data

Name: Merit Laboratories, Inc.
Project: F-41
Matrix: Water
Date Collected: 03-Dec-18 00:00

Laboratory Data

Lab Sample: 1803949-01
Date Received: 06-Dec-18 11:44
Column: BEH C18

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
13C2-4:2 FTS	IS	71.8	40 - 150		B8L0062	10-Dec-18	0.250 L	13-Dec-18 06:15	1
13C2-PFHxA	IS	86.0	70 - 130		B8L0062	10-Dec-18	0.250 L	13-Dec-18 06:15	1
13C4-PFHpA	IS	87.4	60 - 150		B8L0062	10-Dec-18	0.250 L	13-Dec-18 06:15	1
18O2-PFHxS	IS	85.5	60 - 130		B8L0062	10-Dec-18	0.250 L	13-Dec-18 06:15	1
13C2-PFOA	IS	86.1	60 - 130		B8L0062	10-Dec-18	0.250 L	13-Dec-18 06:15	1
13C5-PFNA	IS	86.6	50 - 130		B8L0062	10-Dec-18	0.250 L	13-Dec-18 06:15	1
13C8-PFOSA	IS	50.4	20 - 150		B8L0062	10-Dec-18	0.250 L	13-Dec-18 06:15	1
13C8-PFOS	IS	88.7	60 - 130		B8L0062	10-Dec-18	0.250 L	13-Dec-18 06:15	1
13C2-PFDA	IS	91.5	60 - 130		B8L0062	10-Dec-18	0.250 L	13-Dec-18 06:15	1
13C2-8:2 FTS	IS	72.8	40 - 150		B8L0062	10-Dec-18	0.250 L	13-Dec-18 06:15	1
d3-MeFOSAA	IS	77.1	50 - 150		B8L0062	10-Dec-18	0.250 L	13-Dec-18 06:15	1
d5-EtFOSAA	IS	78.7	50 - 150		B8L0062	10-Dec-18	0.250 L	13-Dec-18 06:15	1
13C2-PFUnA	IS	82.7	60 - 130		B8L0062	10-Dec-18	0.250 L	13-Dec-18 06:15	1
13C2-PFDoA	IS	68.6	30 - 130		B8L0062	10-Dec-18	0.250 L	13-Dec-18 06:15	1
13C2-PFTeDA	IS	54.2	20 - 150		B8L0062	10-Dec-18	0.250 L	13-Dec-18 06:15	1

DL - Detection Limit
LOD - Limit of Detection
LOQ - Limit of quantitation
Results reported to the DL.

DATA QUALIFIERS & ABBREVIATIONS

B	**This compound was also detected in the method blank**
Conc.	**Concentration**
D	**Dilution**
DL	**Detection limit**
E	**The associated compound concentration exceeded the calibration range of the instrument**
H	**Recovery and/or RPD was outside laboratory acceptance limits**
I	**Chemical Interference**
J	**The amount detected is below the Reporting Limit/LOQ**
LOD	**Limits of Detection**
LOQ	**Limits of Quantitation**
M	**Estimated Maximum Possible Concentration (CA Region 2 projects only)**
NA	**Not applicable**
ND	**Not Detected**
Q	**Ion ratio outside of 70-130% of Standard Ratio. (DOD PFAS projects only)**
TEQ	**Toxic Equivalency**
U	**Not Detected (specific projects only)**
*	**See Cover Letter**

Unless otherwise noted, solid sample results are reported in dry weight. Tissue samples are reported in wet weight.

Vista Analytical Laboratory Certifications

Accrediting Authority	Certificate Number
Alaska Department of Environmental Conservation	17-013
Arkansas Department of Environmental Quality	18-008-0
California Department of Health – ELAP	2892
DoD ELAP - A2LA Accredited - ISO/IEC 17025:2005	3091.01
Florida Department of Health	E87777
Hawaii Department of Health	N/A
Louisiana Department of Environmental Quality	01977
Maine Department of Health	2018017
Michigan Department of Environmental Quality	9932
Minnesota Department of Health	1322288
New Hampshire Environmental Accreditation Program	207718
New Jersey Department of Environmental Protection	CA003
New York Department of Health	11411
Oregon Laboratory Accreditation Program	4042-009
Pennsylvania Department of Environmental Protection	015
Texas Commission on Environmental Quality	T104704189-18-9
Virginia Department of General Services	9618
Washington Department of Ecology	C584-18
Wisconsin Department of Natural Resources	998036160

Current certificates and lists of licensed parameters are located in the Quality Assurance office and are available upon request.

NELAP Accredited Test Methods

MATRIX: Air	
Description of Test	**Method**
Determination of Polychlorinated p-Dioxins & Polychlorinated Dibenzofurans	EPA 23
Determination of Polychlorinated p-Dioxins & Polychlorinated Dibenzofurans	EPA TO-9A

MATRIX: Biological Tissue	
Description of Test	**Method**
Tetra- through Octa-Chlorinated Dioxins and Furans by Isotope Dilution GC/HRMS	EPA 1613B
Brominated Diphenyl Ethers by HRGC/HRMS	EPA 1614A
Chlorinated Biphenyl Congeners in Water, Soil, Sediment, and Tissue by GC/HRMS	EPA 1668A/C
Pesticides in Water, Soil, Sediment, Biosolids, and Tissue by HRGC/HRMS	EPA 1699
Perfluorinated Alkyl Acids in Drinking Water by SPE and LC/MS/MS	EPA 537
Polychlorinated Dibenzo-p-Dioxins and Polychlorinated Dibenzofurans by GC/HRMS	EPA 8280A/B
Polychlorinated Dibenzodioxins (PCDDs) and Polychlorinated Dibenzofurans (PCDFs) by GC/HRMS	EPA 8290/8290A

MATRIX: Drinking Water	
Description of Test	**Method**
2,3,7,8-Tetrachlorodibenzo- p-dioxin (2,3,7,8-TCDD) GC/HRMS	EPA 1613/1613B
1,4-Dioxane (1,4-Diethyleneoxide) analysis by GC/HRMS	EPA 522
Perfluorinated Alkyl Acids in Drinking Water by SPE and LC/MS/MS	EPA 537
Perfluorinated Alkyl Acids in Drinking Water by SPE and LC/MS/MS	ISO 25101 2009

MATRIX: Non-Potable Water	
Description of Test	**Method**
Tetra- through Octa-Chlorinated Dioxins and Furans by Isotope Dilution GC/HRMS	EPA 1613B
Brominated Diphenyl Ethers by HRGC/HRMS	EPA 1614A
Chlorinated Biphenyl Congeners in Water, Soil, Sediment, and Tissue by GC/HRMS	EPA 1668A/C
Pesticides in Water, Soil, Sediment, Biosolids, and Tissue by HRGC/HRMS	EPA 1699
Perfluorinated Alkyl Acids in Drinking Water by SPE and LC/MS/MS	EPA 537
Dioxin by GC/HRMS	EPA 613
Polychlorinated Dibenzo-p-Dioxins and Polychlorinated Dibenzofurans by GC/HRMS	EPA 8280A/B
Polychlorinated Dibenzodioxins (PCDDs) and Polychlorinated Dibenzofurans (PCDFs) by GC/HRMS	EPA 8290/8290A

MATRIX: Solids	
Description of Test	**Method**
Tetra-Octa Chlorinated Dioxins and Furans by Isotope Dilution GC/HRMS	EPA 1613
Tetra- through Octa-Chlorinated Dioxins and Furans by Isotope Dilution GC/HRMS	EPA 1613B
Brominated Diphenyl Ethers by HRGC/HRMS	EPA 1614A
Chlorinated Biphenyl Congeners in Water, Soil, Sediment, and Tissue by GC/HRMS	EPA 1668A/C
Pesticides in Water, Soil, Sediment, Biosolids, and Tissue by HRGC/HRMS	EPA 1699
Perfluorinated Alkyl Acids in Drinking Water by SPE and LC/MS/MS	EPA 537
Polychlorinated Dibenzo-p-Dioxins and Polychlorinated Dibenzofurans by GC/HRMS	EPA 8280A/B
Polychlorinated Dibenzodioxins (PCDDs) and Polychlorinated Dibenzofurans (PCDFs) by GC/HRMS	EPA 8290/8290A

Michigan Department of Environmental Quality
Laboratory Services Section

Analysis Request Sheet 1803949 1.7°C

Lab Work Order Number	Project Name	Matrix
	F-41	WATER

Site Code/Project Number	AY	CC Email 1	Project TAT Days	Sample Collector	
		pincumbej		Jeff Pincumbe	
Dept-Division-District	Index	CC Email 2	Project Due Date	Sample Collector Phone	
RRD-Saginaw Bay		shireyb		517-243-3171	
State Project Manager	PCA	CC Email 3		Contract Firm	
Mike Jury					
State Project Manager Email	Project	Overflow Lab Choice 1	Accept Analysis hold time codes	Contract Firm Primary Contact	
Jurym1	6B22				
State Project Manager Phone	Phase	Overflow Lab Choice 2		Primary Contact Phone	
989 894 6255					

	Lab Use Only	Field Sample Identification	Collection Date	Collection Time	Container Count	Comments
1		CR-B-2	12-3-18			PFAS
2						
3						
4						
5						
6						
7						
8						
9						
10						

ORGANIC CHEMISTRY

VOA - Volatile Organic Acidic	
Volatiles - Full List	1 2 3 4 5 6 7 8 9 10
BTEX/MTBE/TMB only	1 2 3 4 5 6 7 8 9 10
Chlorinated only	1 2 3 4 5 6 7 8 9 10
GRO	1 2 3 4 5 6 7 8 9 10
1,4 Dioxane	1 2 3 4 5 6 7 8 9 10
METH - Methane, Ethane, Ethene	
Methane, Ethane, Ethene	1 2 3 4 5 6 7 8 9 10
ON - Pesticides, PCBs	
Pesticides & PCBs	1 2 3 4 5 6 7 8 9 10
Pesticides only	1 2 3 4 5 6 7 8 9 10
PCBs only	1 2 3 4 5 6 7 8 9 10
Toxaphene	1 2 3 4 5 6 7 8 9 10
Chlordane	1 2 3 4 5 6 7 8 9 10
BNA - Base Neutral Acids	
BNAs	1 2 3 4 5 6 7 8 9 10
Benzidines	1 2 3 4 5 6 7 8 9 10
PNAs only	1 2 3 4 5 6 7 8 9 10
BNs only	1 2 3 4 5 6 7 8 9 10
Acids only	1 2 3 4 5 6 7 8 9 10
Organic Specialty Requests	
Library search - Volatiles	1 2 3 4 5 6 7 8 9 10
Library search - SemiVols	1 2 3 4 5 6 7 8 9 10
Finger Print	1 2 3 4 5 6 7 8 9 10
DRO / ORO	1 2 3 4 5 6 7 8 9 10

METALS CHEMISTRY PACKAGES

OpMemo2 - Total	1 2 3 4 5 6 7 8 9 10
OpMemo2 - Dissolved	1 2 3 4 5 6 7 8 9 10
(Sb,As,Ba,Be,Cd,Cr,Cu,Co,Fe,Pb,Mn,Hg,Mo,Ni,Se,Ag,Tl,V,Zn)	
Michigan10 - Total	1 2 3 4 5 6 7 8 9 10
Michigan10 - Dissolved	1 2 3 4 5 6 7 8 9 10
(As,Ba,Cd,Cr,Cu,Pb,Hg,Se,Ag,Zn)	

MAD - DISSOLVED METALS

Diss - Silver - Ag	1 2 3 4 5 6 7 8 9 10
Diss - Aluminum - Al	1 2 3 4 5 6 7 8 9 10
Diss - Arsenic - As	1 2 3 4 5 6 7 8 9 10
Diss - Boron - B	1 2 3 4 5 6 7 8 9 10
Diss - Barium - Ba	1 2 3 4 5 6 7 8 9 10
Diss - Beryllium - Be	1 2 3 4 5 6 7 8 9 10
Diss - Cadmium - Cd	1 2 3 4 5 6 7 8 9 10
Diss - Cobalt - Co	1 2 3 4 5 6 7 8 9 10
Diss - Chromium - Cr	1 2 3 4 5 6 7 8 9 10
Diss - Copper - Cu	1 2 3 4 5 6 7 8 9 10
Diss - Iron - Fe	1 2 3 4 5 6 7 8 9 10
Diss - Mercury - Hg	1 2 3 4 5 6 7 8 9 10
Diss - Lithium - Li	1 2 3 4 5 6 7 8 9 10
Diss - Manganese - Mn	1 2 3 4 5 6 7 8 9 10
Diss - Molybdenum - Mo	1 2 3 4 5 6 7 8 9 10
Diss - Nickel - Ni	1 2 3 4 5 6 7 8 9 10
Diss - Lead - Pb	1 2 3 4 5 6 7 8 9 10
Diss - Antimony - Sb	1 2 3 4 5 6 7 8 9 10
Diss - Selenium - Se	1 2 3 4 5 6 7 8 9 10
Diss - Strontium - Sr	1 2 3 4 5 6 7 8 9 10
Diss - Titanium - Ti	1 2 3 4 5 6 7 8 9 10
Diss - Thallium - Tl	1 2 3 4 5 6 7 8 9 10
Diss - Uranium - U	1 2 3 4 5 6 7 8 9 10
Diss - Vanadium - V	1 2 3 4 5 6 7 8 9 10
Diss - Zinc - Zn	1 2 3 4 5 6 7 8 9 10
Diss - Calcium - Ca	1 2 3 4 5 6 7 8 9 10
Diss - Potassium - K	1 2 3 4 5 6 7 8 9 10
Diss - Magnesium - Mg	1 2 3 4 5 6 7 8 9 10
Diss - Sodium - Na	1 2 3 4 5 6 7 8 9 10
Diss - Hardness - Ca, Mg	1 2 3 4 5 6 7 8 9 10
MD - Metals Dissolved	
Lab Filtration	1 2 3 4 5 6 7 8 9 10

MA - TOTAL METALS

Silver - Ag	1 2 3 4 5 6 7 8 9 10
Aluminum - Al	1 2 3 4 5 6 7 8 9 10
Arsenic - As	1 2 3 4 5 6 7 8 9 10
Boron - B	1 2 3 4 5 6 7 8 9 10
Barium - Ba	1 2 3 4 5 6 7 8 9 10
Beryllium - Be	1 2 3 4 5 6 7 8 9 10
Cadmium - Cd	1 2 3 4 5 6 7 8 9 10
Cobalt - Co	1 2 3 4 5 6 7 8 9 10
Chromium - Cr	1 2 3 4 5 6 7 8 9 10
Copper - Cu	1 2 3 4 5 6 7 8 9 10
Iron - Fe	1 2 3 4 5 6 7 8 9 10
Mercury - Hg	1 2 3 4 5 6 7 8 9 10
Lithium - Li	1 2 3 4 5 6 7 8 9 10
Manganese - Mn	1 2 3 4 5 6 7 8 9 10
Molybdenum - Mo	1 2 3 4 5 6 7 8 9 10
Nickel - Ni	1 2 3 4 5 6 7 8 9 10
Lead - Pb	1 2 3 4 5 6 7 8 9 10
Antimony - Sb	1 2 3 4 5 6 7 8 9 10
Selenium - Se	1 2 3 4 5 6 7 8 9 10
Strontium - Sr	1 2 3 4 5 6 7 8 9 10
Titanium - Ti	1 2 3 4 5 6 7 8 9 10
Thallium - Tl	1 2 3 4 5 6 7 8 9 10
Uranium - U	1 2 3 4 5 6 7 8 9 10
Vanadium - V	1 2 3 4 5 6 7 8 9 10
Zinc - Zn	1 2 3 4 5 6 7 8 9 10
Calcium - Ca	1 2 3 4 5 6 7 8 9 10
Potassium - K	1 2 3 4 5 6 7 8 9 10
Magnesium - Mg	1 2 3 4 5 6 7 8 9 10
Sodium - Na	1 2 3 4 5 6 7 8 9 10
Hardness - Ca, Mg	1 2 3 4 5 6 7 8 9 10
LHG - Low Level Mercury	
Mercury Low Level - Hg	1 2 3 4 5 6 7 8 9 10

GENERAL CHEMISTRY

GB	Total Cyanide - CN	1 2 3 4 5 6 7 8 9 10
GB	Amenable Cyanide - CN	1 2 3 4 5 6 7 8 9 10
GCN	Available Cyanide - CN	1 2 3 4 5 6 7 8 9 10
CA	Chlorophyll	1 2 3 4 5 6 7 8 9 10
GN	Ortho Phosphate - OP	1 2 3 4 5 6 7 8 9 10
GN	Nitrite - NO_3	1 2 3 4 5 6 7 8 9 10
GN	Nitrate - NO_3 (Calc.)	1 2 3 4 5 6 7 8 9 10
GN	Suspended Solids - SS	1 2 3 4 5 6 7 8 9 10
GN	Dissolved Solids - TDS	1 2 3 4 5 6 7 8 9 10
MN	Diss Solids - TDS (Calc.)	1 2 3 4 5 6 7 8 9 10
GN	Turbidity	1 2 3 4 5 6 7 8 9 10
MN	Total Alkalinity	1 2 3 4 5 6 7 8 9 10
MN	Bicarb/Carb Alkalinity (includes Total Alkalinity)	1 2 3 4 5 6 7 8 9 10
MN	Chloride - Cl	1 2 3 4 5 6 7 8 9 10
MN	Fluoride - F	1 2 3 4 5 6 7 8 9 10
MN	Sulfate - SO4	1 2 3 4 5 6 7 8 9 10
MN	Chromium 6 - Cr+6	1 2 3 4 5 6 7 8 9 10
MN	Conductivity	1 2 3 4 5 6 7 8 9 10
MN	pH	1 2 3 4 5 6 7 8 9 10
GA	Chem Oxyg Dem - COD	1 2 3 4 5 6 7 8 9 10
GA	Diss Org Carbon - DOC (FF) (Field - Filtered & Preserved)	1 2 3 4 5 6 7 8 9 10
GN	Diss Org Carbon - DOC (LF) (Lab - Filtered & Preserved)	1 2 3 4 5 6 7 8 9 10
GA	Total Org Carbon - TOC	1 2 3 4 5 6 7 8 9 10
GA	Ammonia - NH3	1 2 3 4 5 6 7 8 9 10
GA	Nitrate+Nitrite - NO3+NO2	1 2 3 4 5 6 7 8 9 10
GA	Kjeldahl Nitrogen - KN	1 2 3 4 5 6 7 8 9 10
GA	Total Phosphorus - TP	1 2 3 4 5 6 7 8 9 10

Chain of Custody

	Relinquished by	Received By	Date / Time
Print Name & Org	Jeff Pincumbe - MDEQ	B. Benedict	
Signature:		Bobbi Benedict	12/6/18 1144
Print Name & Org			
Signature:			
Print Name & Org			
Signature:			

Vista Analytical Laboratory

Sample Log-In Checklist

Page # 1 of 1

Vista Work Order #: 1803949 TAT 8Td

Samples Arrival:	**Date/Time** 12/6/18 1144	**Initials:** BLB	**Location:** WR-2 **Shelf/Rack:** NA
Logged In:	**Date/Time** 12/6/18 1641	**Initials:** BLB	**Location:** WR-2 **Shelf/Rack:** A3/E4

Delivered By:	FedEx	(UPS)	On Trac	GSO	DHL	Hand Delivered	Other
Preservation:	(Ice)		Blue Ice		Dry Ice		None

Temp °C: 1.8 (uncorrected)	**Probe used:** Y (N)	**Thermometer ID:** IR-4
Temp °C: 1.7 (corrected)		

	YES	NO	NA
Adequate Sample Volume Received?	✓		
Holding Time Acceptable?	✓		
Shipping Container(s) Intact?	✓		✓
Shipping Custody Seals Intact?			✓
Shipping Documentation Present?	✓		
Airbill Trk # 1Z 4XX 260 22 1001 5061	✓		
Sample Container Intact?	✓		
Sample Custody Seals Intact?			✓
Chain of Custody / Sample Documentation Present?	✓		
COC Anomaly/Sample Acceptance Form completed?	✓		
If Chlorinated or Drinking Water Samples, Acceptable Preservation?			✓
Preservation Documented: $Na_2S_2O_3$ Trizma None Other	Yes	(No)	NA

Shipping Container	Vista	(Client)	Retain	(Return)	Dispose

Comments: Sample label ID COC ID

CR-B2 14-18' CR-B-2

Chain of Custody Anomaly/Sample Acceptance Form

Vista Analytical Laboratory

Client:	Merit Laboratories, Inc.	Workorder Number:	1803949
Contact:	Maya Murshak	Date Received:	06-Dec-18 11:44
Email:	mayamurshak@meritlabs.com	Documented by/date:	B.Benedict 12/06/2018
Phone:	(517) 827-2744		

Please review the following information and complete the Client Authorization section. To comply with NELAC regulations, we must receive authorization before proceeding with sample analysis.

Thank you,

Martha Maier
mmaier@vista-analytical.com
916-673-1520

The following information or item is needed to proceed with analysis:

☐ Complete Chain-of-Custody	☐ Preservative	☐ Collector's Name
☐ Test Method Requested	☐ Sample Identification	☐ Sample Type
☐ Analyte List Requested	☒ Sample Collection Time: **See Comments**	☐ Sample Location
☐ Other:		

The following anomalies were noted. Authorization is needed to proceed with analysis.

☐ Temperature outside < 6°C Range Samples Affected: _____

Temperature _____°C Ice Present? Yes No Melted

☒ Sample ID Discrepancy: **See Comments**	☐ Insufficient Sample Size
☐ Sample Holding Time Missed	☐ Sample Container(s) Broken
☐ Custody Seals Broken	☐ Incorrect Container Type

Comments: Chain of Custody omitted Collection times of the samples.

COC ID:	Sample Label ID:
CR-B-2	CR-B2 **14-18'**

Client Authorization

Proceed with Analysis: (YES) NO Signature and Date _____ 12/28/18

Client Comments/Instructions Client notified via email 12/07/18.