MEMO

To:

Christine Matlock, MDEQ

Joe Rogers, MDEQ

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Copies:

Dave Favero, RACER

From:

Patrick Curry, Arcadis

Alex Villhauer, Arcadis

Date:

December 13, 2019

Arcadis Project No.:

30006870.03100

Subject:

RACER Lansing Additional Plant 3 PFAS Monitoring Well Installation

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The following memo provides a summary of the additional monitoring well installation and sampling completed at the Revitalizing Auto Communities Environmental Response (RACER) Trust Plant 3 (Site) located in Lansing Township, Michigan. Additional monitoring wells were installed to provided further delineation of poly- and perfluoroalkyl substances (PFAS) associated with the plating operations formerly conducted at Plant 3. The new monitoring wells, area of PFAS impacts and Plant 3 layout are shown on **Figure 1**. Details regarding the plating operations and PFAS characterization was provided in the Plant 3 PFAS Investigation Summary Report (Arcadis, 2018) and Plant 3 Investigation Summary Report Addendum (Arcadis, 2019). The scope of work for additional monitoring wells was included as part of the addendum report and modified during follow-up discussion with the Michigan Department of Environment, Great Lakes and Energy (EGLE) on July 22, 2019.

MONITORING WELL INSTALLTION

Previous sampling at the Site has shown detections of perfluorooctanesulfonic acid (PFOS) above groundwater-surface water interaction (GSI) Criteria (12 nanograms per liter [ng/L]) and combined perfluorooctanoic acid (PFOA) and PFOS detections exceeding Drinking Water (DW) Criteria (70 ng/L). As outlined in the addendum report (Arcadis, 2019) and agreed upon with EGLE the monitoring well installation scope of work included the following:

- A total of 6 soil borings were completed near the perimeter of the perched PFOS plume using direct push drilling methods. 5 of the 6 soil borings were converted to monitoring wells (MW-19-110 through MW-19-114), using rotary drilling methods:
  - One soil boring located north of the eastern property boundary impacts and was then converted into a perched monitoring well (MW-19-110/SB-P3-BY189) to serve as a perimeter sentinel well but was dry and a sample could not be collected.
  - Two perched monitoring wells installed north (MW-19-113) and northwest (MW-19-112) of the Plant 3 perched PFOS plume to provide delineation and act as perimeter sentinel wells.
  - One perched monitoring well along the western property boundary of Plant 3 as a perimeter sentinel well (MW-19-111).
  - One off-site perched monitoring well installed in Westside Park to the east of MW-18-95 as a sentinel for migration (MW-19-114).
  - One soil boring located north of the eastern property boundary impacts and was then converted into a perched monitoring well (MW-19-110/SB-P3-BY189) to serve as a perimeter sentinel well but was dry and a sample could not be collected.
  - One additional soil boring was completed south of the eastern property boundary impacts (SB-P3-EE183) but was observed to be dry and was not converted into a monitoring well.

Boring logs for each of the 6 soil borings are included as **Attachment 1**. The five new monitoring wells have been incorporated into the revised Interim Groundwater Monitoring Plan (IGMP) submitted to EGLE on October 28, 2019.

Groundwater Sampling

Groundwater samples were collected from the five new monitoring wells for PFAS analysis during one event on September 19, 2019. At each groundwater sampling location, a sample was collected using low-flow groundwater sampling techniques. To avoid cross contamination, all sampling was conducted in accordance with the Arcadis PFAS Sampling Technical Guidance Instruction. QA/QC samples were collected at a rate of one duplicate for the sampling event and one equipment blank from the water level meter. Laboratory analytical reports are included as **Attachment 2**. Samples were submitted to SGS Accutest Laboratory located in Orlando, Florida and analyzed for the 24 PFAS contained in the draft EGLE PFAS Minimum Laboratory Analyte List (EGLE, 2018) using modified USEPA Method 537 with isotope dilution (DoD QSM 5.1). The monitoring well locations and results are shown on **Figure 1**. A sample was not collected from MW-19-110 on September 19, 2019 as the well was dry. The results for the five monitoring wells are summarized on **Table 1**.

RESULTS & DISCUSSION

The current GSI criteria for PFOS is 12 nanograms per liter (ng/L) and 12,000 ng/L for PFOA. The DW criterion is 70 ng/L for combined concentrations of PFOS and PFOA. The analytical data is summarized on **Table 1**. PFOS and PFOA results for each of the 5 new monitoring wells is summarized on **Figure 1**. Notable results include:

- MW-19-113: Located north of the Plant 3 perched PFAS plume and intended to provide delineation and act as a perimeter sentinel well. The PFOS concentration of 23.3 ng/L exceeds GSI Criteria. The combined concentrations of PFOS and PFOA (29.9 ng/L) does not exceed DW Criteria. The GSI pathway is being addressed via storm sewer bulkheading. This location will continue to be monitored.
- No exceedances were detected at the new wells along the west property boundary at MW-19-111 or MW-19-112, or off-site to the east at MW-19-114.
- The quality control samples, including equipment blanks, field duplicates, MS/MSDs, and laboratory method blanks, are included in the laboratory analytical reports (Attachment 2). An equipment blank was collected from the water level meter and contained no detections of any PFAS analytes. The field duplicate demonstrated acceptable repeatability with less than 10% difference from the parent sample concentration. No analytes were detected within the laboratory method blanks or instrument blanks.

PROPOSED ACTIVITIES

No additional drilling or delineation is proposed at this time, but RACER will continue to monitor these wells on a semi-annual basis in accordance with the revised IGMP. These wells will be sampled as part of the Fourth Quarter 2019 sampling event and results will be included in the 2019 Annual Report.

If you have any questions, please contact Patrick Curry (Arcadis) at 810-225-1926 or Dave Favero (RACER Trust) at 734-879-9525.

Sincerely,

Arcadis of Michigan, LLC

Alex Villhauer

Staff Geologist

Patrick Curry, PG, CPG

Technical Expert (Geo)

Enclosures:

TABLES

Table 1 RACER Lansing Plant 3 – PFAS Groundwater Analytical Data

FIGURES

Figure 1 September 2019 Groundwater Analytical Results for New Wells at Plant 3

ATTACHMENTS

Attachment 1 Soil Boring Logs

Attachment 2 Laboratory Analytical Reports

REFERENCES

Arcadis. 2018. Plant 3 PFAS Investigation Summary Report. RACER Trust, Lansing, Michigan, Plant 3. November 2.

Arcadis. 2019. PFAS CSM Report Addendum – RACER Trust – Plants 3. RACER Trust Site. Lansing, Michigan. July 24.

TABLES

Table 1
PFAS Groundwater Analytical Data
RACER Trust Plant 3
Lansing, Michigan

ARCADIS Design & Consultancy for natural and built assets

Location ID:		MDEQ Residential Drinking Water Criteria (2017)	EGLE Groundwater Surface Water Interface (GSI) Criteria (2017)	MW-19-110*	MW-19-111	MW-19-112	MW-19-113	MW-19-114	MW-19-114	Equipment Blank
Plant:				Plant 3	Plant 3	Plant 3	Plant 3	Plant 3	Plant 3	Plant 3
Date Collected:				NS	9/19/2019	9/19/2019	9/19/2019	9/19/2019	9/19/2019	9/19/2019
Sample Name:				NS	MW-19-111 (091919)	MW-19-112 (091919)	MW-19-113 (091919)	MW-19-114 (091919)	MW-19-114 DUP	EQ BLK05
Sample Number:				NS	FA68283-5	FA68283-4	FA68283-3	FA68283-1	FA68283-2	FA68283-6
Screen Interval (ft. bgs):	Units			8.0-13.0	20.0-25.0	9.0-14.0	16.0-21.0	6.0-11.0	6.0-11.0	N/A
Poly- and Perfluorinated Alkyl Substances (USEPA Method 537 Modified with Isotope Dilution)										
4:2 Flourotelemer Sulfonate (4:2 FTS)	ng/L	- -	- -	NS	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
6:2 Flourotelemer Sulfonate (6:2 FTS)	ng/L	- -	- -	NS	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
8:2 Flourotelemer Sulfonate (8:2 FTS)	ng/L	- -	- -	NS	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
MeFOSAA	ng/L	- -	- -	NS	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
EtFOSAA	ng/L	- -	- -	NS	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Perfluorobutanesulfonic acid (PFBS)	ng/L	- -	- -	NS	< 7.7	< 7.7	< 7.7	< 7.7	**1.98 J**	< 7.7
Perfluorobutanoic acid (PFBA)	ng/L	- -	- -	NS	**4.09 J**	< 15.0	**6.92 J**	< 15.0	< 15.0	< 15.0
Perfluorodecanesulfonic acid (PFDS)	ng/L	- -	- -	NS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Perfluorodecanoic acid (PFDA)	ng/L	- -	- -	NS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Perfluorododecanoic acid (PFDoA)	ng/L	- -	- -	NS	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Perfluoroheptanesulfonic Acid (PFHpS)	ng/L	- -	- -	NS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Perfluoroheptanoic acid (PFHpA)	ng/L	- -	- -	NS	< 1.0	< 1.0	**2.48 J**	< 1.0	< 1.0	< 1.0
Perfluorohexanesulfonic acid (PFHxS)	ng/L	- -	- -	NS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Perfluorohexanoic acid (PFHxA)	ng/L	- -	- -	NS	< 7.7	< 7.7	**2.66 J**	< 7.7	< 7.7	< 7.7
Perfluorononanesulfonic acid (PFNS)	ng/L	- -	- -	NS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Perfluorononanoic acid (PFNA)	ng/L	- -	- -	NS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Perfluorooctane Sulfonamide (FOSA)	ng/L	- -	- -	NS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Perfluorooctanesulfonic acid (PFOS)	ng/L	- -	12	NS	< 7.7	< 7.7	**23.3**	< 7.7	< 7.7	< 7.7
Perfluorooctanoic acid (PFOA)	ng/L	- -	12,000	NS	< 7.7	< 7.7	**6.57 J**	< 7.7	< 7.7	< 7.7
Combined PFOS and PFOA	ng/L	70.0	- -	NS	< 7.7	< 7.7	**29.87**	< 7.7	< 7.7	< 7.7
Perfluoropentanesulfonic acid (PFPeS)	ng/L	- -	- -	NS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Perfluoropentanoic acid (PFPeA)	ng/L	- -	- -	NS	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Perfluorotetradecanoic acid (PFTeA)	ng/L	- -	- -	NS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Perfluorotridecanoic Acid (PFTriA)	ng/L	- -	- -	NS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Perfluoroundecanoic acid (PFUnA)	ng/L	- -	- -	NS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Other PFAS (sum of compounds not including PFOS and PFOA)	ng/L	- -	- -	NS		< 15.0	**12.06 J**	< 15.0	**1.98 J**	< 15.0

Notes:

Bold result denotes detection is above the laboratory reporting limit but below EGLE Part 201 Generic Cleanup Criteria

Shaded text denotes detection is above EGLE Criteria

GSI Criteria based on a non-drinking water receptor

DUP represents duplicate sample analytical results.

- - = Not listed in the EGLE Criteria Tables.

< = Not Detected, less than reference level

*A sample was not collected from MW-19-110, well was dry

Acronyms and Abbreviations:

ft. bgs = Feet below ground surface

ng/L = Nanograms per liter

N/A = Not applicable

NA = Not analyzed

NS = Not sampled

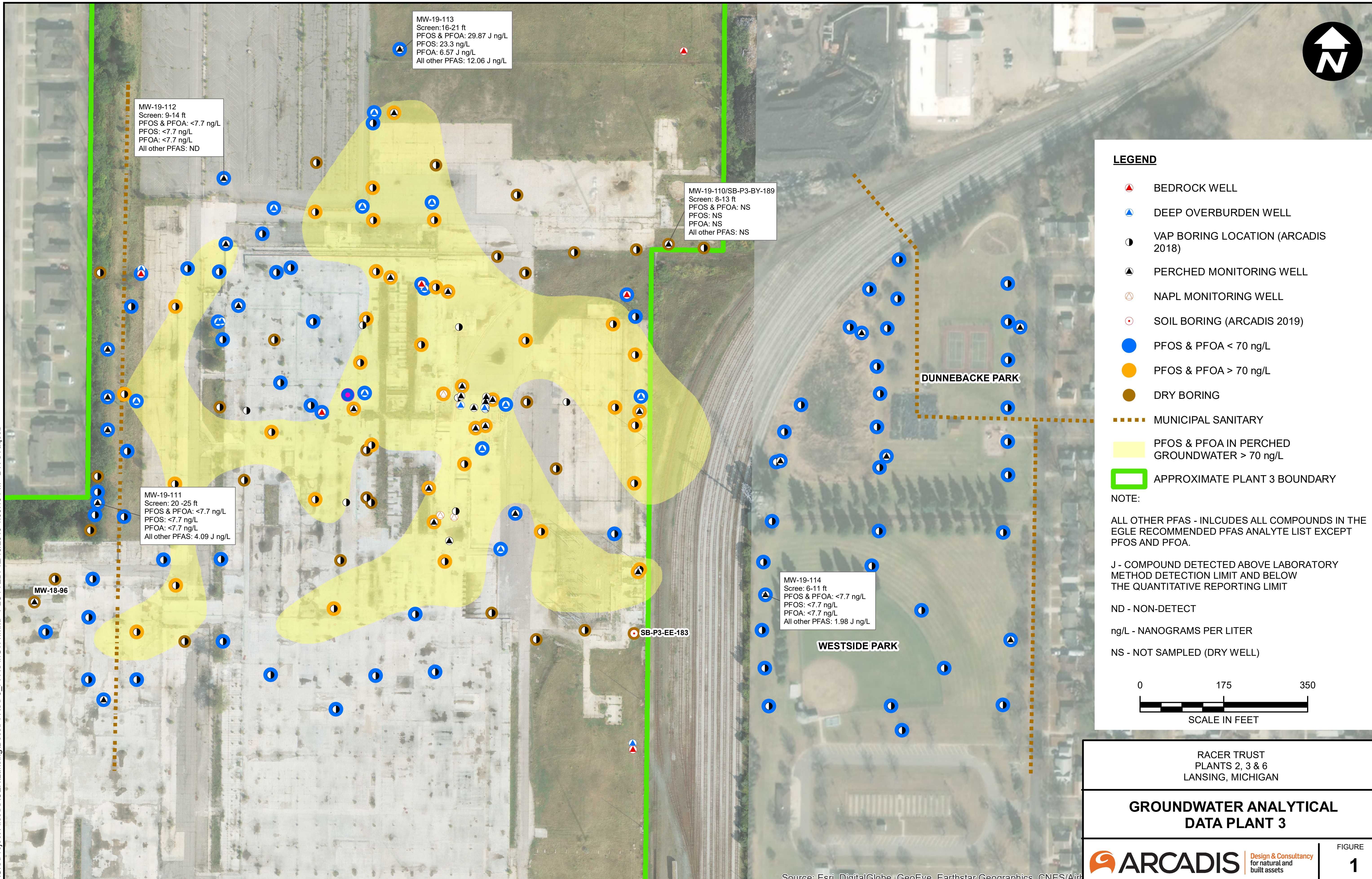
EGLE = Michigan Department of Environment, Great Lakes, and Energy

USEPA = United States Environmental Protection Agency

Qualifiers:

J = Indicates and estimated value from the lab (lab qualifier)

FIGURES


MW-19-113
Screen:16-21 ft
PFOS & PFOA: 29.87 J ng/L
PFOS: 23.3 ng/L
PFOA: 6.57 J ng/L
All other PFAS: 12.06 J ng/L
MW-19-112
Screen: 9-14 ft
PFOS & PFOA: <7.7 ng/L
PFOS: <7.7 ng/L
PFOA: <7.7 ng/L
All other PFAS: ND
MW-19-110/SB-P3-BY-189
Screen: 8-13 ft
PFOS & PFOA: NS
PFOS: NS
PFOA: NS
All other PFAS: NS
MW-19-111
Screen: 20 -25 ft
PFOS & PFOA: <7.7 ng/L
PFOS: <7.7 ng/L
PFOA: <7.7 ng/L
All other PFAS: 4.09 J ng/L
MW-18-96
MW-19-114
Scree: 6-11 ft
PFOS & PFOA: <7.7 ng/L
PFOS: <7.7 ng/L
PFOA: <7.7 ng/L
All other PFAS: 1.98 J ng/L
SB-P3-EE-183
DUNNEBACKE PARK
WESTSIDE PARK
N
LEGEND
BEDROCK WELL
DEEP OVERBURDEN WELL
VAP BORING LOCATION (ARCADIS 2018)
PERCHED MONITORING WELL
NAPL MONITORING WELL
SOIL BORING (ARCADIS 2019)
PFOS & PFOA < 70 ng/L
PFOS & PFOA > 70 ng/L
DRY BORING
MUNICIPAL SANITARY
PFOS & PFOA IN PERCHED GROUNDWATER > 70 ng/L
APPROXIMATE PLANT 3 BOUNDARY
NOTE:
ALL OTHER PFAS - INLCUDES ALL COMPOUNDS IN THE EGLE RECOMMENDED PFAS ANALYTE LIST EXCEPT PFOS AND PFOA.
J - COMPOUND DETECTED ABOVE LABORATORY METHOD DETECTION LIMIT AND BELOW THE QUANTITATIVE REPORTING LIMIT
ND - NON-DETECT
ng/L - NANOGRAMS PER LITER
NS - NOT SAMPLED (DRY WELL)
0
175
350
SCALE IN FEET
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airb
RACER TRUST
PLANTS 2, 3 & 6
LANSING, MICHIGAN
GROUNDWATER ANALYTICAL DATA PLANT 3
ARCADIS
Design & Consultancy for natural and built assets
FIGURE
1

CITY: KNOXVILLE DIV: ENV DB: A.SMITH PIC: PM: TM: TR: PROJECT NUMBER: COORDINATE SYSTEM: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl
G:\GIS\Project Files\RACER\Lansing\Docs\PFAS\P3_PFAS inGW1.mxd PLOTTED: 12/13/2019 1:30:15 PM BY: SYaqoob

ATTACHMENT 1

Soil Boring Logs

ARCADIS Design & Consultancy for natural and built assets

Soil Boring Log

Boring No.: MW-19-110/SB-P3-BY189

Sheet: 1 of 1

Project Name: RACER Lansing
Project Number: 30006870.03100
Project Location: Lansing, MI

Date Started: 08/23/2019
Date Completed: 08/23/2019

Logger: E. Redner
Editor: C. Cisco
Weather Conditions: 72° F, Sunny

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
1					0.0		(0.0-2.0') SAND, very fine to coarse, subrounded; little silt; poorly sorted; dry; loose. Note: Topsoil and organics present.	Stick-up Casing (0.0-1.0') Cement	
2					0.0				
3			55		0.0		(2.0-10.0') SILT; some sand, very fine to fine; little clay, nonplastic to low plasticity, rapid dilatancy; trace sand, very coarse, subrounded to subangular; trace granules to small pebbles, subrounded to subangular; dry to moist; dense; yellowish brown (10YR 5/6).	4.25' dia. drilled hole (1.0-5.0') Bentonite Pellets	
4					0.0				
5					0.0				
6					0.0				
7					0.0			(5.0-13.0') Filter Pack Sand	
8			26		0.0				
9					0.0		Note: Pinkish gray color (5YR 6/2) from 7.7-7.9' bgs.		
10					0.0			(8.0-13.0') 2.0" dia. Stainless-Steel 0.010-Slot Screen	
11					0.0		(10.0-12.5') SILT; and SAND, very fine to fine; trace granules, subrounded; well sorted; wet to moist; loose to medium dense; yellowish brown (10YR 5/6). Note: Boring appeared wet at 10.0' bgs.		
12					0.0				
13			60		0.0		(12.5-15.0') CLAY, medium plasticity, slow to rapid dilatancy; and SILT; little sand, very fine to very coarse, subrounded; little granules to small pebbles, subrounded; moist to wet; medium dense to dense; yellowish brown (10YR 5/6).		
14					0.0				
15					0.0				
16					0.0		(15.0-20.0') SAND, very fine to medium, subrounded to subangular; little to some silt; well sorted; moist; loose to dense; light yellowish brown (10YR 6/4).	(13.0-20.0') Natural Collapse and Backfill	
17					0.0				
18			58		0.0				
19					0.0				
20					0.0		End of boring at 20.0' bgs.		

Drilling Co.: Stock Drilling
Driller: Ryan Brown
Drilling Method: Hand Auger / Hollow Stem Auger
Drilling Fluid: None
Remarks: Stick-up well casing/capped riser to 3.00' above ground surface. bgs = below ground surface, ss = stainless steel.

Sampling Method: Dual Tube
Sampling Interval: Continuous
Water Level Start (ft. bgs.): 10.0
Water Level Finish (ft. btoc.): NA
Converted to Well: ☒ Yes ☐ No
Surface Elev.:
North Coor:
East Coor:

SOIL BORING LOG_2013 G:\COMMON\RACER LANSING\64479\06 NOTES AND DATA\LOGS\RACER LANSING - 2019 P3 MW INSTALL_112619.GPJ ARCADIS_2013.GDT 11/27/19

ARCADIS Design & Consultancy for natural and built assets

Soil Boring Log

Boring No.: MW-19-111

Sheet: 1 of 2

Project Name: RACER Lansing
Project Number: 30006870.03100
Project Location: Lansing, MI

Date Started: 08/26/2019
Date Completed: 08/26/2019

Logger: E. Redner
Editor: C. Cisco
Weather Conditions: 64° F, Sunny

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
1					0.0		(0.0-8.0') FILL: SAND, very fine to very coarse, subrounded to subangular; and GRANULES to MEDIUM PEBBLES, subrounded to subangular; some silt; poorly sorted; dry; loose to dense; brownish yellow (10YR 6/6) to yellowish brown (10YR 5/4). Note: Fill material. Topsoil present.	Stick-up Casing (0.0-1.0') Cement	
2					0.0				
3			44		0.0				
4					0.0				
5					0.0			4.25' dia. drilled hole	
6					0.0				
7					0.0				
8			50		0.0				
9					0.0		(8.0-12.5') FILL: some clay, medium plasticity, slow to rapid dilatancy; some silt; some sand, very fine to fine; little organics; trace granules, subrounded; moist; medium stiff to stiff; grayish brown (10YR 5/2). Note: Fill material.	(1.0-17.0') Bentonite Pellets	
10					0.0				
11					0.0				
12					0.0				
13			50		0.0		(12.5-16.0') SILT; some sand, very fine to fine; little clay, nonplastic to low plasticity, rapid dilatancy; well sorted; moist; dense; yellowish brown (10YR 5/4).		
14					0.0				
15					0.0		Note: Some light reddish brown (5YR 6/4) coloring at 15.0' bgs.		
16					0.0		(16.0-24.5') SAND, very fine to medium, subrounded; some silt; poorly sorted; moist to wet; loose to dense; yellowish brown (10YR 5/6). Note: Boring appeared wet at 17.0' bgs.		
17					0.0				
18			38		0.0			(17.0-25.0') Filter Pack Sand	
19					0.0				
20					0.0				

Drilling Co.: Stock Drilling
Driller: Ryan Brown
Drilling Method: Hand Auger / Hollow Stem Auger
Drilling Fluid: None
Remarks: Stick-up well casing/capped riser to 2.88' above ground surface. bgs = below ground surface, ss = stainless steel.

Sampling Method: Dual Tube
Sampling Interval: Continuous
Water Level Start (ft. bgs.): 17.0
Water Level Finish (ft. btoc.): NA
Converted to Well: ☒ Yes ☐ No
Surface Elev.:
North Coor:
East Coor:

SOIL BORING LOG_2013 G:\COMMON\RACER LANSING\64479\06 NOTES AND DATA\LOGS\RACER LANSING - 2019 P3 MW INSTALL_112619.GPJ ARCADIS_2013.GDT 11/27/19

ARCADIS Design & Consultancy for natural and built assets

Soil Boring Log

Boring No.: MW-19-111

Sheet: 2 of 2

Project Name: RACER Lansing
Project Number: 30006870.03100
Project Location: Lansing, MI

Date Started: 08/26/2019
Date Completed: 08/26/2019

Logger: E. Redner
Editor: C. Cisco
Weather Conditions: 64° F, Sunny

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
21					0.0		(16.0-24.5') SAND, very fine to medium, subrounded; some silt; poorly sorted; moist to wet; loose to dense; yellowish brown (10YR 5/6). Note: Boring appeared wet at 20.0' bgs.	(20.0-25.0') 2.0" dia. Stainless-Steel 0.010-Slot Screen	
22					0.0				
23			32		0.0				
24					0.0				
25					0.0				
26					0.0		(24.5-26.0') SAND, fine to very coarse, subrounded to subangular; and GRANULES, subrounded to subangular; poorly sorted; wet; loose; gray (10YR 5/1). Note: Boring appeared wet at 24.5' bgs.		
27					0.0		(26.0-27.0') SILT, low plasticity, rapid dilatancy; some clay; some sand, very fine to fine; poorly sorted; moist; dense to very dense; dark grayish brown (10YR 4/2).	(25.0-30.0') Natural Collapse and Backfill	
28			45		0.0		(27.0-28.5') SAND, very fine to very coarse, subrounded to subangular; and GRANULES, subrounded to subangular; little silt; poorly sorted; wet; loose to medium dense; dark grayish brown (10YR 4/2). Note: Boring appeared wet at 27.0' bgs.		
29					0.0				
30					0.0		(28.5-30.0') CLAY, medium plasticity, slow dilatancy; some silt; little sand, very fine to fine; moist; stiff; dark grayish brown (10YR 4/2).		
31							End of boring at 30.0' bgs.		
32									
33									
34									
35									
36									
37									
38									
39									
40									
41									

Remarks:

ARCADIS Design & Consultancy for natural and built assets

Soil Boring Log

Boring No.: MW-19-112

Sheet: 1 of 2

Project Name: RACER Lansing
Project Number: 30006870.03100
Project Location: Lansing, MI

Date Started: 08/26/2019
Date Completed: 08/26/2019

Logger: E. Redner
Editor: C. Cisco
Weather Conditions: 74° F, Sunny

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
1					0.0		(0.0-0.3') ASPHALT.	Stick-up Casing (0.0-1.0') Cement	
2					0.0		(0.3-3.0') FILL: SAND, fine to very coarse, subrounded to subangular; and GRANULES to SMALL PEBBLES, subrounded to subangular; some to little silt; poorly sorted; dry; loose to medium dense; very dark grayish brown (10YR 3/2) to dark yellowish brown (10YR 4/4). Note: Fill material.		
3			36		0.0				
4					0.0		(3.0-6.0') SILT, low plasticity, rapid dilatancy; some sand, very fine to fine; some clay; well sorted; moist; dense; yellowish brown (10YR 5/4).	(1.0-6.0') Bentonite Pellets 4.25' dia. drilled hole	
5					0.0				
6					0.0				
7					0.0		(6.0-12.5') SAND, very fine to medium, subrounded; some silt, low plasticity, rapid dilatancy; little clay; poorly sorted; moist to wet; medium dense; dark grayish brown (10YR 4/2).	(6.0-14.0') Filter Pack Sand	
8			53		0.0				
9					0.0				
10					0.0				
11					0.0		Note: Boring appeared very moist to wet at 11.0' bgs.	(9.0-14.0') 2.0" dia. Stainless-Steel 0.010-Slot Screen	
12					0.0				
13			41		0.0		(12.5-14.5') CLAY, medium to high plasticity, slow dilatancy; and SILT; little to trace sand, very fine to fine; moist; soft to medium stiff; brown (10YR 4/3).		
14					0.0				
15					0.0		(14.5-18.0') CLAY, low plasticity, slow dilatancy; very dark grayish brown (10YR 3/2) to dark brown (10YR 3/3). Note: Peat present.		
16					0.0				
17					0.0			(14.0-25.0') Natural Collapse and Backfill	
18			36		0.0				
19					0.0		(18.0-19.5') CLAY, medium plasticity, slow dilatancy; some silt; moist; soft; dark grayish brown (10YR 4/2).		
20					0.0		(19.5-20.0') SAND, fine to very coarse, subangular; and		

Drilling Co.: Stock Drilling
Driller: Ryan Brown
Drilling Method: Hand Auger / Hollow Stem Auger
Drilling Fluid: None
Remarks: Stick-up well casing/capped riser to 3.15' above ground surface. bgs = below ground surface, ss = stainless steel.

Sampling Method: Dual Tube
Sampling Interval: Continuous
Water Level Start (ft. bgs.): 11.0
Water Level Finish (ft. btoc.): NA
Converted to Well: ☒ Yes ☐ No
Surface Elev.:
North Coor:
East Coor:

SOIL BORING LOG_2013 G:\COMMON\RACER LANSING\64479\06 NOTES AND DATA\LOGS\RACER LANSING - 2019 P3 MW INSTALL_112619.GPJ ARCADIS_2013.GDT 11/27/19

ARCADIS Design & Consultancy for natural and built assets

Soil Boring Log

Boring No.: MW-19-112

Sheet: 2 of 2

Project Name: RACER Lansing
Project Number: 30006870.03100
Project Location: Lansing, MI

Date Started: 08/26/2019
Date Completed: 08/26/2019

Logger: E. Redner
Editor: C. Cisco
Weather Conditions: 74° F, Sunny

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
21					0.0		GRANULES to MEDIUM PEBBLES, subangular; some silt; poorly sorted; moist to wet; medium dense; dark gray (10YR 4/1).		
22					0.0		(20.0-25.0') SILT; and SAND, very fine to fine; trace sand, coarse to very coarse, subangular; little to trace clay, nonplastic to low plasticity, rapid dilatancy; gray (10YR 6/1).		
23			58		0.0			(14.0-25.0') Natural Collapse and Backfill	
24					0.0				
25					0.0				
							End of boring at 25.0' bgs.		
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									
41									

Remarks:

ARCADIS Design & Consultancy for natural and built assets

Soil Boring Log

Boring No.: MW-19-113

Sheet: 1 of 2

Project Name: RACER Lansing
Project Number: 30006870.03100
Project Location: Lansing, MI

Date Started: 08/26/2019
Date Completed: 08/26/2019

Logger: E. Redner
Editor: C. Cisco
Weather Conditions: 69° F, Rainy

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
1			45		0.0		(0.0-0.3') ASPHALT.	Stick-up Casing (0.0-1.0') Cement	
2					0.0		(0.3-3.0') FILL: SAND, fine to medium, subrounded to subangular; trace granules, subangular; some to little silt; poorly sorted; dry; loose; brown (10YR 4/3). Note: Organics present.		
3					0.0				
4					0.0		(3.0-6.5') SILT, nonplastic to low plasticity, rapid dilatancy; some sand, very fine to fine; little clay; well sorted; moist; medium dense; yellowish brown (10YR 5/4).	4.25' dia. drilled hole	
5					0.0				
6			54		0.0				
7					0.0		(6.5-11.0') SAND, very fine to medium, subrounded to subangular; some silt, nonplastic to low plasticity, rapid dilatancy; little clay; little sand, coarse, subangular; little granules, subangular; poorly sorted; moist; medium dense; yellowish brown (10YR 5/4).	(1.0-13.0') Bentonite Pellets	
8					0.0				
9					0.0				
10					0.0				
11			31		0.0		(11.0-16.0') SILT, medium plasticity, slow to rapid dilatancy; and CLAY; poorly sorted; moist to wet; medium dense to dense; yellowish brown (10YR 5/4).		
12					0.0				
13					0.0				
14					0.0				
15					0.0			(13.0-21.0') Filter Pack Sand	
16			50		0.0		(16.0-23.0') SAND, very fine to medium, subrounded to subangular; some silt; well sorted; wet; loose to medium dense; yellowish brown (10YR 5/4). Note: Boring appeared wet at 16.0' bgs.		
17					0.0				
18					0.0			(16.0-21.0') 2.0" dia. Stainless-Steel 0.010-Slot Screen	
19					0.0				
20					0.0				

Drilling Co.: Stock Drilling
Driller: Ryan Brown
Drilling Method: Hand Auger / Hollow Stem Auger
Drilling Fluid: None
Remarks: Stick-up well casing/capped riser to ~3.00' above ground surface. bgs = below ground surface, ss = stainless steel.

Sampling Method: Dual Tube
Sampling Interval: Continuous
Water Level Start (ft. bgs.): 16.0
Water Level Finish (ft. btoc.): NA
Converted to Well: ☒ Yes ☐ No
Surface Elev.:
North Coor:
East Coor:

ARCADIS Design & Consultancy for natural and built assets

Soil Boring Log

Boring No.: MW-19-113

Sheet: 2 of 2

Project Name: RACER Lansing
Project Number: 30006870.03100
Project Location: Lansing, MI

Date Started: 08/26/2019
Date Completed: 08/26/2019

Logger: E. Redner
Editor: C. Cisco
Weather Conditions: 69° F, Rainy

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
21					0.0		(16.0-23.0') SAND, very fine to medium, subrounded to subangular; some silt; well sorted; wet; loose to medium dense; yellowish brown (10YR 5/4). Note: Boring appeared wet at 16.0' bgs.		
22					0.0				
23			60		0.0			(21.0-25.0') Natural Collapse and Backfill	
24					0.0		(23.0-24.0') SILT; some clay, medium to high plasticity, slow dilatancy; trace sand, very fine to fine; well sorted; moist; medium dense; yellowish brown (10YR 5/4).		
25					0.0		(24.0-25.0') SAND, fine to very coarse, subrounded to subangular; some to little silt; poorly sorted; moist; medium dense; yellowish brown (10YR 5/4).		
26							End of boring at 25.0' bgs.		
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									
41									

Remarks:

ARCADIS Design & Consultancy for natural and built assets

Soil Boring Log

Boring No.: MW-19-114

Sheet: 1 of 1

Project Name: RACER Lansing
Project Number: 30006870.03100
Project Location: Lansing, MI

Date Started: 08/27/2019
Date Completed: 08/27/2019

Logger: E. Redner
Editor: C. Cisco
Weather Conditions: 71° F, Cloudy

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
1					0.0		(0.0-0.2') TOPSOIL.	Stick-up Casing (0.0-1.0') Cement	
2					0.0		(0.2-1.5') SAND, very fine to very coarse, subrounded to angular; and GRANULES, subrounded to angular; poorly sorted; dry; very loose; dark yellowish brown (10YR 4/4). Note: Organics present.		
3			30		0.0		(1.5-3.5') SILT; and CLAY, medium to high plasticity, slow dilatancy; little sand, very fine to fine; well sorted; moist; medium dense; dark yellowish brown (10YR 3/4).	(1.0-3.0') Bentonite Pellets 4.25' dia. drilled hole	
4					0.0		(3.5-6.0') SAND, very fine to medium, subrounded to subangular; some silt; some clay, low to medium plasticity, slow to rapid dilatancy; trace granules, subrounded; poorly sorted; moist to wet; medium dense; yellowish brown (10YR 5/4). Note: Boring appeared wet at 5.0' bgs.	(3.0-11.0') Filter Pack Sand	
5					0.0				
6					0.0		(6.0-7.5') SILT, medium to low plasticity, rapid dilatancy; some sand, very fine to fine; some to little clay; poorly sorted; moist to wet; medium dense; yellowish brown (10YR 5/4).		
7					0.0				
8			44		0.0		(7.5-10.0') SAND, very fine to coarse, subrounded to subangular; some silt, low plasticity, rapid dilatancy; some to little clay; poorly sorted; moist to wet; medium dense; yellowish brown (10YR 5/4).	(6.0-11.0') 2.0" dia. Stainless-Steel 0.010-Slot Screen	
9					0.0				
10					0.0				
11					0.0		(10.0-16.0') SILT, nonplastic to low plasticity, rapid dilatancy; some sand, very fine to fine; little clay; trace granules, subrounded; well sorted; moist; dense; dark grayish brown (10YR 4/2).		
12					0.0				
13			60		0.0				
14					0.0				
15					0.0			(11.0-20.0') Natural Collapse and Backfill	
16					0.0				
17					0.0		(16.0-20.0') SILT; and CLAY, medium plasticity, slow dilatancy; little to trace sand, very fine to fine; well sorted; moist to dry; dense to very dense; gray (10YR 5/1). Note: Hit refusal at 20.0' bgs.		
18			60		0.0				
19					0.0				
20					0.0		End of boring at 20.0' bgs.		

Drilling Co.: Stock Drilling
Driller: Ryan Brown
Drilling Method: Hand Auger / Hollow Stem Auger
Drilling Fluid: None
Remarks: Flush-mount well casing with top of casing 0.43' bgs. bgs = below ground surface, ss = stainless steel.

Sampling Method: Dual Tube
Sampling Interval: Continuous
Water Level Start (ft. bgs.): 5.0
Water Level Finish (ft. btoc.): NA
Converted to Well: ☒ Yes ☐ No
Surface Elev.:
North Coor:
East Coor:

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ARCADIS Design & Consultancy for natural and built assets

Soil Boring Log

Boring No.: SB-P3-EE183

Sheet: 1 of 2

Project Name: RACER Lansing
Project Number: 30006870.03100
Project Location: Lansing, MI

Date Started: 08/23/2019
Date Completed: 08/23/2019

Logger: E. Redner
Editor: C. Cisco
Weather Conditions: 69° F, Sunny

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
0			0		NR		(0.0-1.0') CONCRETE.		
1					0.0				
2			13		0.0		(1.0-3.0') CLAY, low to medium plasticity, slow dilatancy; some silt; some sand, very fine to fine; dry to moist; medium stiff; dark yellowish brown (10YR 4/4). Note: Fill material.		
3					0.0				
4					0.0		(3.0-3.3') SAND, very fine to coarse, subrounded; some to little silt; poorly sorted; moist; loose; dark yellowish brown (10YR 4/4).		
5					1.6		(3.3-5.0') CLAY, high plasticity, slow dilatancy; some silt; little sand, very fine to fine; moist; medium stiff; dark yellowish brown (10YR 4/4).		
6					0.0		(5.0-16.5') CLAY, low to high plasticity, slow to rapid dilatancy; and to some silt; trace sand, very coarse, subrounded to rounded; trace granules to medium pebbles, subrounded to rounded; moist; medium stiff to stiff; dark yellowish brown (10YR 4/4) to dark grayish brown (10YR 4/2).		
7					5.6				
8			33		15.0				
9					10.0				
10					7.0			(0.0-25.0') Bentonite Backfill	
11					0.0				
12					5.5				
13			60		4.6				
14					3.0				
15					3.2				
16					0.0				
17					0.0		(16.5-19.5') SAND, very fine to medium, subrounded; some silt; well sorted; moist to dry; medium dense to dense; yellowish brown (10YR 5/4) to pale brown (10YR 6/3).		
18			60		0.0				
19					0.0				
20					0.0				

Drilling Co.: Stock Drilling
Driller: Ryan Brown
Drilling Method: Hand Auger / Hollow Stem Auger
Drilling Fluid: None
Remarks: bgs = below ground surface.

Sampling Method: Dual Tube
Sampling Interval: Continuous
Water Level Start (ft. bgs.): NA
Water Level Finish (ft. btoc.): NA
Converted to Well: ☐ Yes ☒ No
Surface Elev.:
North Coor:
East Coor:

SOIL BORING LOG_2013 G:\COMMON\RACER LANSING\64479\06 NOTES AND DATA\LOGS\RACER LANSING - 2019 P3 MW INSTALL_112619.GPJ ARCADIS_2013.GDT 11/27/19

ARCADIS Design & Consultancy for natural and built assets

Soil Boring Log

Boring No.: SB-P3-EE183

Sheet: 2 of 2

Project Name: RACER Lansing
Project Number: 30006870.03100
Project Location: Lansing, MI

Date Started: 08/23/2019
Date Completed: 08/23/2019

Logger: E. Redner
Editor: C. Cisco
Weather Conditions: 69° F, Sunny

Depth (feet)	Sample Interval	Blow Counts	Recovery (in.)	Sample ID	PID (ppm)	USCS Class	Description	Construction Details	Well
21					0.0		(19.5-21.0') SILT, nonplastic to low plasticity, rapid dilatancy; some sand, very fine to fine; little clay; little sand, coarse to very coarse, subrounded to subangular; little granules to small pebbles, subrounded to subangular; dry; very loose; yellowish brown (10YR 5/4) to dark grayish brown (10YR 4/2).		
22					0.0				
23			47		0.0		(21.0-25.0') CLAY, medium to high plasticity, slow to rapid dilatancy; some silt; some sand, very fine to very coarse, subrounded to subangular; some granules to small pebbles, subrounded to subangular; moist; soft to medium stiff; dark grayish brown (10YR 4/2). Note: Hit refusal at 20.0' bgs.	(0.0-25.0') Bentonite Backfill	
24					0.0				
25					0.0				
26							End of boring at 25.0' bgs.		
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									
41									

Remarks:

ATTACHMENT 2

Laboratory Analytical Reports

The results set forth herein are provided by SGS North America Inc.

e-Hardcopy 2.0
Automated Report

Technical Report for

Arcadis

Racer Lansing PFAS Delineation; Lansing, MI

B0064479.2019

SGS Job Number: FA68283

Sampling Date: 09/19/19

Report to:

Arcadis
300 S Washington Sq Suite 315
Lansing, MI 48933
alex.villhauer@arcadis.com; christine.gregg@arcadis.com;
daniel.stockard@arcadis.com; michael.spacil@arcadis.com
ATTN: Alex Villhauer

Total number of pages in report: 42

Test results contained within this data package meet the requirements of the National Environmental Laboratory Accreditation Program and/or state specific certification programs as applicable.

Caitlin Brice, M.S.
General Manager

Client Service contact: Andrea Colby 407-425-6700

Certifications: FL(E83510), LA(03051), KS(E-10327), IL(200063), NC(573), NJ(FL002), NY(12022), SC(96038001) DoD ELAP(ANAB L2229), AZ(AZ0806), CA(2937), TX(T104704404), PA(68-03573), VA(460177), AK, AR, IA, KY, MA, MS, ND, NH, NV, OK, OR, UT, WA, WV

Sections: 1 2 3 4 5

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SGS North America Inc.

Sample Summary

Arcadis

Job No: FA68283

Racer Lansing PFAS Delineation; Lansing, MI
Project No: B0064479.2019

Sample Number	Collected Date	Time	By	Received	Matrix Code	Type	Client Sample ID
This report contains results reported as ND = Not detected. The following applies: Organics ND = Not detected above the MDL							
FA68283-1	09/19/19	11:31	GS	09/21/19	AQ	Ground Water	MW-19-114 (091919)
FA68283-2	09/19/19	11:31	GS	09/21/19	AQ	Ground Water	MW-19-114 DUP
FA68283-3	09/19/19	13:21	GS	09/21/19	AQ	Ground Water	MW-19-113 (091919)
FA68283-4	09/19/19	15:06	GS	09/21/19	AQ	Ground Water	MW-19-112 (091919)
FA68283-5	09/19/19	16:26	GS	09/21/19	AQ	Ground Water	MW-19-111 (091919)
FA68283-6	09/19/19	10:25	GS	09/21/19	AQ	Equipment Blank	EQ BLK05

Summary of Hits

Job Number: FA68283
Account: Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI
Collected: 09/19/19

Lab Sample ID / Analyte	Client Sample ID	Result/ Qual	RL	MDL	Units	Method
FA68283-1	**MW-19-114 (091919)**					
No hits reported in this sample.						
FA68283-2	**MW-19-114 DUP**					
Perfluorobutanesulfonic acid		0.00198 J	0.0077	0.0019	ug/l	EPA 537M BY ID
FA68283-3	**MW-19-113 (091919)**					
Perfluorobutanoic acid		0.00692 J	0.015	0.0038	ug/l	EPA 537M BY ID
Perfluorohexanoic acid		0.00266 J	0.0077	0.0019	ug/l	EPA 537M BY ID
Perfluoroheptanoic acid		0.00248 J	0.0077	0.0019	ug/l	EPA 537M BY ID
Perfluorooctanoic acid		0.00657 J	0.0077	0.0019	ug/l	EPA 537M BY ID
Perfluorooctanesulfonic acid		0.0233	0.0077	0.0029	ug/l	EPA 537M BY ID
FA68283-4	**MW-19-112 (091919)**					
No hits reported in this sample.						
FA68283-5	**MW-19-111 (091919)**					
Perfluorobutanoic acid		0.00409 J	0.015	0.0038	ug/l	EPA 537M BY ID
FA68283-6	**EQ BLK05**					
No hits reported in this sample.						

Sample Results

Report of Analysis

Report of Analysis

Client Sample ID:	MW-19-114 (091919)		
Lab Sample ID:	FA68283-1	**Date Sampled:**	09/19/19
Matrix:	AQ - Ground Water	**Date Received:**	09/21/19
Method:	EPA 537M BY ID EPA 537 MOD	**Percent Solids:**	n/a
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	3Q9927.D	1	09/27/19 21:15	NG	09/25/19 12:30	OP76990	S3Q176
Run #2							

	Initial Volume	Final Volume
Run #1	130 ml	1.0 ml
Run #2		

CAS No.	Compound	Result	RL	MDL	Units	Q
PERFLUOROALKYLCARBOXYLIC ACIDS						
375-22-4	Perfluorobutanoic acid	ND	0.015	0.0038	ug/l	
2706-90-3	Perfluoropentanoic acid	ND	0.0077	0.0029	ug/l	
307-24-4	Perfluorohexanoic acid	ND	0.0077	0.0019	ug/l	
375-85-9	Perfluoroheptanoic acid	ND	0.0077	0.0019	ug/l	
335-67-1	Perfluorooctanoic acid	ND	0.0077	0.0019	ug/l	
375-95-1	Perfluorononanoic acid	ND	0.0077	0.0019	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.0077	0.0019	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0077	0.0019	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0077	0.0029	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0077	0.0019	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0077	0.0019	ug/l	
PERFLUOROALKYLSULFONATES						
375-73-5	Perfluorobutanesulfonic acid	ND	0.0077	0.0019	ug/l	
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0077	0.0019	ug/l	
355-46-4	Perfluorohexanesulfonic acid	ND	0.0077	0.0019	ug/l	
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0077	0.0019	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	ND	0.0077	0.0029	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0077	0.0019	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0077	0.0019	ug/l	
PERFLUOROOCTANESULFONAMIDES						
754-91-6	PFOSA	ND	0.0077	0.0019	ug/l	
PERFLUOROOCTANESULFONAMIDOACETIC ACIDS						
2355-31-9	MeFOSAA	ND	0.038	0.0077	ug/l	
2991-50-6	EtFOSAA	ND	0.038	0.0077	ug/l	
FLUOROTELOMER SULFONATES						
757124-72-4	4:2 Fluorotelomer sulfonate	ND	0.015	0.0038	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.015	0.0038	ug/l	

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	MW-19-114 (091919)		
Lab Sample ID:	FA68283-1	**Date Sampled:**	09/19/19
Matrix:	AQ - Ground Water	**Date Received:**	09/21/19
Method:	EPA 537M BY ID EPA 537 MOD	**Percent Solids:**	n/a
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

CAS No.	Compound	Result	RL	MDL	Units	Q
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.015	0.0038	ug/l	

CAS No.	ID Standard Recoveries	Run# 1	Run# 2	Limits
	13C4-PFBA	86%		30-140%
	13C5-PFPeA	98%		40-140%
	13C5-PFHxA	97%		50-150%
	13C4-PFHpA	95%		50-150%
	13C8-PFOA	99%		50-150%
	13C9-PFNA	100%		50-150%
	13C6-PFDA	87%		50-150%
	13C7-PFUnDA	90%		50-150%
	13C2-PFDoDA	93%		50-150%
	13C2-PFTeDA	129%		40-150%
	13C3-PFBS	91%		50-150%
	13C3-PFHxS	90%		50-150%
	13C8-PFOS	93%		50-150%
	13C8-FOSA	87%		30-140%
	d3-MeFOSAA	135%		50-150%
	13C2-4:2FTS	88%		50-150%
	13C2-6:2FTS	85%		50-150%
	13C2-8:2FTS	74%		50-150%

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	MW-19-114 DUP		
Lab Sample ID:	FA68283-2	**Date Sampled:**	09/19/19
Matrix:	AQ - Ground Water	**Date Received:**	09/21/19
Method:	EPA 537M BY ID EPA 537 MOD	**Percent Solids:**	n/a
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	3Q9929.D	1	09/27/19 21:46	NG	09/25/19 12:30	OP76990	S3Q176
Run #2							

	Initial Volume	Final Volume
Run #1	130 ml	1.0 ml
Run #2		

CAS No.	Compound	Result	RL	MDL	Units	Q
PERFLUOROALKYLCARBOXYLIC ACIDS						
375-22-4	Perfluorobutanoic acid	ND	0.015	0.0038	ug/l	
2706-90-3	Perfluoropentanoic acid	ND	0.0077	0.0029	ug/l	
307-24-4	Perfluorohexanoic acid	ND	0.0077	0.0019	ug/l	
375-85-9	Perfluoroheptanoic acid	ND	0.0077	0.0019	ug/l	
335-67-1	Perfluorooctanoic acid	ND	0.0077	0.0019	ug/l	
375-95-1	Perfluorononanoic acid	ND	0.0077	0.0019	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.0077	0.0019	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0077	0.0019	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0077	0.0029	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0077	0.0019	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0077	0.0019	ug/l	
PERFLUOROALKYLSULFONATES						
375-73-5	Perfluorobutanesulfonic acid	0.00198	0.0077	0.0019	ug/l	J
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0077	0.0019	ug/l	
355-46-4	Perfluorohexanesulfonic acid	ND	0.0077	0.0019	ug/l	
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0077	0.0019	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	ND	0.0077	0.0029	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0077	0.0019	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0077	0.0019	ug/l	
PERFLUOROOCTANESULFONAMIDES						
754-91-6	PFOSA	ND	0.0077	0.0019	ug/l	
PERFLUOROOCTANESULFONAMIDOACETIC ACIDS						
2355-31-9	MeFOSAA	ND	0.038	0.0077	ug/l	
2991-50-6	EtFOSAA	ND	0.038	0.0077	ug/l	
FLUOROTELOMER SULFONATES						
757124-72-4	4:2 Fluorotelomer sulfonate	ND	0.015	0.0038	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.015	0.0038	ug/l	

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	MW-19-114 DUP		
Lab Sample ID:	FA68283-2	**Date Sampled:**	09/19/19
Matrix:	AQ - Ground Water	**Date Received:**	09/21/19
Method:	EPA 537M BY ID EPA 537 MOD	**Percent Solids:**	n/a
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

CAS No.	Compound	Result	RL	MDL	Units	Q
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.015	0.0038	ug/l	

CAS No.	ID Standard Recoveries	Run# 1	Run# 2	Limits
	13C4-PFBA	84%		30-140%
	13C5-PFPeA	96%		40-140%
	13C5-PFHxA	93%		50-150%
	13C4-PFHpA	91%		50-150%
	13C8-PFOA	94%		50-150%
	13C9-PFNA	95%		50-150%
	13C6-PFDA	84%		50-150%
	13C7-PFUnDA	87%		50-150%
	13C2-PFDoDA	90%		50-150%
	13C2-PFTeDA	125%		40-150%
	13C3-PFBS	87%		50-150%
	13C3-PFHxS	85%		50-150%
	13C8-PFOS	87%		50-150%
	13C8-FOSA	82%		30-140%
	d3-MeFOSAA	83%		50-150%
	13C2-4:2FTS	85%		50-150%
	13C2-6:2FTS	82%		50-150%
	13C2-8:2FTS	71%		50-150%

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range

J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	MW-19-113 (091919)		
Lab Sample ID:	FA68283-3	**Date Sampled:**	09/19/19
Matrix:	AQ - Ground Water	**Date Received:**	09/21/19
Method:	EPA 537M BY ID EPA 537 MOD	**Percent Solids:**	n/a
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	3Q9931.D	1	09/27/19 22:16	NG	09/25/19 12:30	OP76990	S3Q176
Run #2							

	Initial Volume	Final Volume
Run #1	130 ml	1.0 ml
Run #2		

CAS No.	Compound	Result	RL	MDL	Units	Q
PERFLUOROALKYLCARBOXYLIC ACIDS						
375-22-4	Perfluorobutanoic acid	0.00692	0.015	0.0038	ug/l	J
2706-90-3	Perfluoropentanoic acid	ND	0.0077	0.0029	ug/l	
307-24-4	Perfluorohexanoic acid	0.00266	0.0077	0.0019	ug/l	J
375-85-9	Perfluoroheptanoic acid	0.00248	0.0077	0.0019	ug/l	J
335-67-1	Perfluorooctanoic acid	0.00657	0.0077	0.0019	ug/l	J
375-95-1	Perfluorononanoic acid	ND	0.0077	0.0019	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.0077	0.0019	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0077	0.0019	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0077	0.0029	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0077	0.0019	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0077	0.0019	ug/l	
PERFLUOROALKYLSULFONATES						
375-73-5	Perfluorobutanesulfonic acid	ND	0.0077	0.0019	ug/l	
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0077	0.0019	ug/l	
355-46-4	Perfluorohexanesulfonic acid	ND	0.0077	0.0019	ug/l	
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0077	0.0019	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	0.0233	0.0077	0.0029	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0077	0.0019	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0077	0.0019	ug/l	
PERFLUOROOCTANESULFONAMIDES						
754-91-6	PFOSA	ND	0.0077	0.0019	ug/l	
PERFLUOROOCTANESULFONAMIDOACETIC ACIDS						
2355-31-9	MeFOSAA	ND	0.038	0.0077	ug/l	
2991-50-6	EtFOSAA	ND	0.038	0.0077	ug/l	
FLUOROTELOMER SULFONATES						
757124-72-4	4:2 Fluorotelomer sulfonate	ND	0.015	0.0038	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.015	0.0038	ug/l	

ND = Not detected MDL = Method Detection Limit J = Indicates an estimated value
RL = Reporting Limit B = Indicates analyte found in associated method blank
E = Indicates value exceeds calibration range N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	MW-19-113 (091919)		
Lab Sample ID:	FA68283-3	**Date Sampled:**	09/19/19
Matrix:	AQ - Ground Water	**Date Received:**	09/21/19
Method:	EPA 537M BY ID EPA 537 MOD	**Percent Solids:**	n/a
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

CAS No.	Compound	Result	RL	MDL	Units	Q
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.015	0.0038	ug/l	

CAS No.	ID Standard Recoveries	Run# 1	Run# 2	Limits
	13C4-PFBA	77%		30-140%
	13C5-PFPeA	87%		40-140%
	13C5-PFHxA	85%		50-150%
	13C4-PFHpA	84%		50-150%
	13C8-PFOA	88%		50-150%
	13C9-PFNA	89%		50-150%
	13C6-PFDA	78%		50-150%
	13C7-PFUnDA	80%		50-150%
	13C2-PFDoDA	87%		50-150%
	13C2-PFTeDA	115%		40-150%
	13C3-PFBS	81%		50-150%
	13C3-PFHxS	77%		50-150%
	13C8-PFOS	81%		50-150%
	13C8-FOSA	77%		30-140%
	d3-MeFOSAA	78%		50-150%
	13C2-4:2FTS	78%		50-150%
	13C2-6:2FTS	77%		50-150%
	13C2-8:2FTS	67%		50-150%

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range

J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	MW-19-112 (091919)		
Lab Sample ID:	FA68283-4	**Date Sampled:**	09/19/19
Matrix:	AQ - Ground Water	**Date Received:**	09/21/19
Method:	EPA 537M BY ID EPA 537 MOD	**Percent Solids:**	n/a
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	3Q10102.D	1	10/03/19 00:46	NG	10/01/19 12:00	OP77080	S3Q179
Run #2							

	Initial Volume	Final Volume
Run #1	125 ml	1.0 ml
Run #2		

CAS No.	Compound	Result	RL	MDL	Units	Q
PERFLUOROALKYLCARBOXYLIC ACIDS						
375-22-4	Perfluorobutanoic acid	ND	0.016	0.0040	ug/l	
2706-90-3	Perfluoropentanoic acid	ND	0.0080	0.0030	ug/l	
307-24-4	Perfluorohexanoic acid	ND	0.0080	0.0020	ug/l	
375-85-9	Perfluoroheptanoic acid	ND	0.0080	0.0020	ug/l	
335-67-1	Perfluorooctanoic acid	ND	0.0080	0.0020	ug/l	
375-95-1	Perfluorononanoic acid	ND	0.0080	0.0020	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.0080	0.0020	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0080	0.0020	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0080	0.0030	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0080	0.0020	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0080	0.0020	ug/l	
PERFLUOROALKYLSULFONATES						
375-73-5	Perfluorobutanesulfonic acid	ND	0.0080	0.0020	ug/l	
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0080	0.0020	ug/l	
355-46-4	Perfluorohexanesulfonic acid	ND	0.0080	0.0020	ug/l	
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0080	0.0020	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	ND	0.0080	0.0030	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0080	0.0020	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0080	0.0020	ug/l	
PERFLUOROOCTANESULFONAMIDES						
754-91-6	PFOSA	ND	0.0080	0.0020	ug/l	
PERFLUOROOCTANESULFONAMIDOACETIC ACIDS						
2355-31-9	MeFOSAA	ND	0.040	0.0080	ug/l	
2991-50-6	EtFOSAA	ND	0.040	0.0080	ug/l	
FLUOROTELOMER SULFONATES						
757124-72-4	4:2 Fluorotelomer sulfonate	ND	0.016	0.0040	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.016	0.0040	ug/l	

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	MW-19-112 (091919)		
Lab Sample ID:	FA68283-4	**Date Sampled:**	09/19/19
Matrix:	AQ - Ground Water	**Date Received:**	09/21/19
Method:	EPA 537M BY ID EPA 537 MOD	**Percent Solids:**	n/a
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

CAS No.	Compound	Result	RL	MDL	Units	Q
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.016	0.0040	ug/l	

CAS No.	ID Standard Recoveries	Run# 1	Run# 2	Limits
	13C4-PFBA	45%		30-140%
	13C5-PFPeA	66%		40-140%
	13C5-PFHxA	70%		50-150%
	13C4-PFHpA	81%		50-150%
	13C8-PFOA	90%		50-150%
	13C9-PFNA	93%		50-150%
	13C6-PFDA	86%		50-150%
	13C7-PFUnDA	83%		50-150%
	13C2-PFDoDA	81%		50-150%
	13C2-PFTeDA	85%		40-150%
	13C3-PFBS	65%		50-150%
	13C3-PFHxS	74%		50-150%
	13C8-PFOS	80%		50-150%
	13C8-FOSA	33%		30-140%
	d3-MeFOSAA	82%		50-150%
	13C2-4:2FTS	72%		50-150%
	13C2-6:2FTS	87%		50-150%
	13C2-8:2FTS	77%		50-150%

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	MW-19-111 (091919)		
Lab Sample ID:	FA68283-5	**Date Sampled:**	09/19/19
Matrix:	AQ - Ground Water	**Date Received:**	09/21/19
Method:	EPA 537M BY ID EPA 537 MOD	**Percent Solids:**	n/a
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	3Q9933.D	1	09/27/19 22:46	NG	09/25/19 12:30	OP76990	S3Q176
Run #2							

	Initial Volume	Final Volume
Run #1	130 ml	1.0 ml
Run #2		

CAS No.	Compound	Result	RL	MDL	Units	Q
PERFLUOROALKYLCARBOXYLIC ACIDS						
375-22-4	Perfluorobutanoic acid	0.00409	0.015	0.0038	ug/l	J
2706-90-3	Perfluoropentanoic acid	ND	0.0077	0.0029	ug/l	
307-24-4	Perfluorohexanoic acid	ND	0.0077	0.0019	ug/l	
375-85-9	Perfluoroheptanoic acid	ND	0.0077	0.0019	ug/l	
335-67-1	Perfluorooctanoic acid	ND	0.0077	0.0019	ug/l	
375-95-1	Perfluorononanoic acid	ND	0.0077	0.0019	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.0077	0.0019	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0077	0.0019	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0077	0.0029	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0077	0.0019	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0077	0.0019	ug/l	
PERFLUOROALKYLSULFONATES						
375-73-5	Perfluorobutanesulfonic acid	ND	0.0077	0.0019	ug/l	
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0077	0.0019	ug/l	
355-46-4	Perfluorohexanesulfonic acid	ND	0.0077	0.0019	ug/l	
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0077	0.0019	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	ND	0.0077	0.0029	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0077	0.0019	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0077	0.0019	ug/l	
PERFLUOROOCTANESULFONAMIDES						
754-91-6	PFOSA	ND	0.0077	0.0019	ug/l	
PERFLUOROOCTANESULFONAMIDOACETIC ACIDS						
2355-31-9	MeFOSAA	ND	0.038	0.0077	ug/l	
2991-50-6	EtFOSAA	ND	0.038	0.0077	ug/l	
FLUOROTELOMER SULFONATES						
757124-72-4	4:2 Fluorotelomer sulfonate	ND	0.015	0.0038	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.015	0.0038	ug/l	

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	MW-19-111 (091919)		
Lab Sample ID:	FA68283-5	**Date Sampled:**	09/19/19
Matrix:	AQ - Ground Water	**Date Received:**	09/21/19
Method:	EPA 537M BY ID EPA 537 MOD	**Percent Solids:**	n/a
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

CAS No.	Compound	Result	RL	MDL	Units	Q
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.015	0.0038	ug/l	

CAS No.	ID Standard Recoveries	Run# 1	Run# 2	Limits
	13C4-PFBA	75%		30-140%
	13C5-PFPeA	90%		40-140%
	13C5-PFHxA	88%		50-150%
	13C4-PFHpA	89%		50-150%
	13C8-PFOA	94%		50-150%
	13C9-PFNA	96%		50-150%
	13C6-PFDA	85%		50-150%
	13C7-PFUnDA	87%		50-150%
	13C2-PFDoDA	97%		50-150%
	13C2-PFTeDA	131%		40-150%
	13C3-PFBS	84%		50-150%
	13C3-PFHxS	84%		50-150%
	13C8-PFOS	88%		50-150%
	13C8-FOSA	79%		30-140%
	d3-MeFOSAA	86%		50-150%
	13C2-4:2FTS	83%		50-150%
	13C2-6:2FTS	82%		50-150%
	13C2-8:2FTS	71%		50-150%

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range

J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	EQ BLK05		
Lab Sample ID:	FA68283-6	**Date Sampled:**	09/19/19
Matrix:	AQ - Equipment Blank	**Date Received:**	09/21/19
Method:	EPA 537M BY ID EPA 537 MOD	**Percent Solids:**	n/a
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	3Q9934.D	1	09/27/19 23:01	NG	09/25/19 12:30	OP76990	S3Q176
Run #2							

	Initial Volume	Final Volume
Run #1	120 ml	1.0 ml
Run #2		

CAS No.	Compound	Result	RL	MDL	Units	Q
PERFLUOROALKYLCARBOXYLIC ACIDS						
375-22-4	Perfluorobutanoic acid	ND	0.017	0.0042	ug/l	
2706-90-3	Perfluoropentanoic acid	ND	0.0083	0.0031	ug/l	
307-24-4	Perfluorohexanoic acid	ND	0.0083	0.0021	ug/l	
375-85-9	Perfluoroheptanoic acid	ND	0.0083	0.0021	ug/l	
335-67-1	Perfluorooctanoic acid	ND	0.0083	0.0021	ug/l	
375-95-1	Perfluorononanoic acid	ND	0.0083	0.0021	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.0083	0.0021	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0083	0.0021	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0083	0.0031	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0083	0.0021	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0083	0.0021	ug/l	
PERFLUOROALKYLSULFONATES						
375-73-5	Perfluorobutanesulfonic acid	ND	0.0083	0.0021	ug/l	
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0083	0.0021	ug/l	
355-46-4	Perfluorohexanesulfonic acid	ND	0.0083	0.0021	ug/l	
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0083	0.0021	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	ND	0.0083	0.0031	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0083	0.0021	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0083	0.0021	ug/l	
PERFLUOROOCTANESULFONAMIDES						
754-91-6	PFOSA	ND	0.0083	0.0021	ug/l	
PERFLUOROOCTANESULFONAMIDOACETIC ACIDS						
2355-31-9	MeFOSAA	ND	0.042	0.0083	ug/l	
2991-50-6	EtFOSAA	ND	0.042	0.0083	ug/l	
FLUOROTELOMER SULFONATES						
757124-72-4	4:2 Fluorotelomer sulfonate	ND	0.017	0.0042	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.017	0.0042	ug/l	

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	EQ BLK05		
Lab Sample ID:	FA68283-6	**Date Sampled:**	09/19/19
Matrix:	AQ - Equipment Blank	**Date Received:**	09/21/19
Method:	EPA 537M BY ID EPA 537 MOD	**Percent Solids:**	n/a
Project:	Racer Lansing PFAS Delineation; Lansing, MI		

CAS No.	Compound	Result	RL	MDL	Units	Q
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.017	0.0042	ug/l	

CAS No.	ID Standard Recoveries	Run# 1	Run# 2	Limits
	13C4-PFBA	91%		30-140%
	13C5-PFPeA	98%		40-140%
	13C5-PFHxA	95%		50-150%
	13C4-PFHpA	93%		50-150%
	13C8-PFOA	94%		50-150%
	13C9-PFNA	95%		50-150%
	13C6-PFDA	86%		50-150%
	13C7-PFUnDA	87%		50-150%
	13C2-PFDoDA	101%		50-150%
	13C2-PFTeDA	132%		40-150%
	13C3-PFBS	91%		50-150%
	13C3-PFHxS	86%		50-150%
	13C8-PFOS	89%		50-150%
	13C8-FOSA	93%		30-140%
	d3-MeFOSAA	95%		50-150%
	13C2-4:2FTS	86%		50-150%
	13C2-6:2FTS	82%		50-150%
	13C2-8:2FTS	74%		50-150%

ND = Not detected MDL = Method Detection Limit
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Misc. Forms

Custody Documents and Other Forms

Includes the following where applicable:

- Certification Exceptions
- Chain of Custody

Parameter Certification Exceptions

Job Number: FA68283
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

The following parameters included in this report are exceptions to NELAC certification.
The certification status of each is indicated below.

Parameter	CAS#	Method	Mat	Certification Status
4:2 Fluorotelomer sulfonate	757124-72-4	EPA 537M BY ID	AQ	Certified by SOP MS014
6:2 Fluorotelomer sulfonate	27619-97-2	EPA 537M BY ID	AQ	Certified by SOP MS014
8:2 Fluorotelomer sulfonate	39108-34-4	EPA 537M BY ID	AQ	Certified by SOP MS014
EtFOSAA	2991-50-6	EPA 537M BY ID	AQ	Certified by SOP MS014
MeFOSAA	2355-31-9	EPA 537M BY ID	AQ	Certified by SOP MS014
PFOSA	754-91-6	EPA 537M BY ID	AQ	Certified by SOP MS014
Perfluorobutanesulfonic acid	375-73-5	EPA 537M BY ID	AQ	Certified by SOP MS014
Perfluorobutanoic acid	375-22-4	EPA 537M BY ID	AQ	Certified by SOP MS014
Perfluorodecanesulfonic acid	335-77-3	EPA 537M BY ID	AQ	Certified by SOP MS014
Perfluorodecanoic acid	335-76-2	EPA 537M BY ID	AQ	Certified by SOP MS014
Perfluorododecanoic acid	307-55-1	EPA 537M BY ID	AQ	Certified by SOP MS014
Perfluoroheptanesulfonic acid	375-92-8	EPA 537M BY ID	AQ	Certified by SOP MS014
Perfluoroheptanoic acid	375-85-9	EPA 537M BY ID	AQ	Certified by SOP MS014
Perfluorohexanesulfonic acid	355-46-4	EPA 537M BY ID	AQ	Certified by SOP MS014
Perfluorohexanoic acid	307-24-4	EPA 537M BY ID	AQ	Certified by SOP MS014
Perfluorononanesulfonic acid	68259-12-1	EPA 537M BY ID	AQ	Certified by SOP MS014
Perfluorononanoic acid	375-95-1	EPA 537M BY ID	AQ	Certified by SOP MS014
Perfluorooctanesulfonic acid	1763-23-1	EPA 537M BY ID	AQ	Certified by SOP MS014
Perfluorooctanoic acid	335-67-1	EPA 537M BY ID	AQ	Certified by SOP MS014
Perfluoropentanesulfonic acid	2706-91-4	EPA 537M BY ID	AQ	Certified by SOP MS014
Perfluoropentanoic acid	2706-90-3	EPA 537M BY ID	AQ	Certified by SOP MS014
Perfluorotetradecanoic acid	376-06-7	EPA 537M BY ID	AQ	Certified by SOP MS014
Perfluorotridecanoic acid	72629-94-8	EPA 537M BY ID	AQ	Certified by SOP MS014
Perfluoroundecanoic acid	2058-94-8	EPA 537M BY ID	AQ	Certified by SOP MS014

SGS North America Inc - Orlando

Chain of Custody

4405 Vineland Road, Suite C-15 Orlando, Fl 32811
TEL. 407-425-6700 FAX: 407-425-0707
www.sgs.com

SGS - ORLANDO JOB # : FA68283 PAGE ____ OF ____

SGS - ORLANDO Quote # | SKIFF #

Client / Reporting Information

Company Name: Arcadis of Michigan LLC
Address: 28550 Cabot Dr Suite 500
City: Nov. State: MI Zip: 48377
Project Contact: Alex Villhauer Email: Alex.Villhauer@arcadis.com
Phone #: 517.324.5036
Sampler(s) Name(s) (Printed)
Sampler 1: Gary Schultz Sampler 2:

Project Information

Project Name: Racer Lansing PFAS
Street
City State
Project #
Fax #
Client Purchase Order #

Analytical Information

PFAS via method 537 mod. isotope dilution QSM5.1

Matrix Codes

DW - Drinking Water
GW - Ground Water
WW - Water
SW - Surface Water
SO - Soil
SL- Sludge
OI - Oil
LIQ - Other Liquid
AIR - Air
SOL - Other Solid

SGS Orlando Sample #	Field ID / Point of Collection	COLLECTION DATE	TIME	SAMPLED BY:	MATRIX	TOTAL # OF BOTTLES	OTHER	NONE	HCl	NaOH	HNO3	H2SO4	NaOH+ZnAc	DI WATER	MEOH	LAB USE ONLY
1	MW-19-114 (09191919)	9/19/19	11:31		GW	2		X							X	
2	MW-19-114 DUP	"	"		"	2		X							X	
3	MW-19-113 (09191919)	9/19/19	13:21		"	2		X							X	
4	MW-19-112 (09191919)	"	15:06		"	2		X							X	
5	MW-19-111 (09191919)	"	16:26		"	2		X							X	
6	EQ BLK 05	9/19/19	10:35			2		X							X	

Turnaround Time (Business days)

10 Day (Business) Approved By: / Date:
7 Day
5 Day
3 Day *RUSH*
2 Day *RUSH*
1 Day *RUSH*
Other
Rush T/A Data Available VIA Email or Labiink

Data Deliverable Information

- [ ] COMMERCIAL "A" (RESULTS ONLY)
- [ ] COMMERCIAL "B" (RESULTS PLUS QC)
- [ ] REDT1 (EPA LEVEL 3)
- [ ] FULLT1 (EPA LEVEL 4)
- [ ] EDD'S

Comments / Remarks

Sample Custody must be documented below each time samples change possession, including courier delivery.

	Relinquished by Sampler/Affiliation	Date Time:	Received By/Affiliation	Relinquished By/Affiliation	Date Time:	Received By/Affiliation
1		9/20/19 1430	2 FX	3 FX	9/21/19	4
5	Relinquished by/Affiliation	Date Time:	6 Received By/Affiliation	7 Relinquished By/Affiliation	Date Time:	8 Received By/Affiliation

Lab Use Only : Cooler Temperature (s) Celsius (corrected): 1.2°

http://www.sgs.com/en/terms-and-conditions

ORLD-SMT-0001-03-FORM-COC (1) Rev 031318

SGS Sample Receipt Summary

Job Number: FA68283 **Client:** ARCADIS OF MICHIGAN LLC. **Project:** RACER LANSING PFAS

Date / Time Received: 9/21/2019 9:14:00 AM **Delivery Method:** FED EX **Airbill #'s:**

Therm ID: IR 1; **Therm CF:** 1; **# of Coolers:** 1

Cooler Temps (Raw Measured) °C: Cooler 1: (1.2);

Cooler Temps (Corrected) °C: Cooler 1: (2.2);

Cooler Information	Y	or	N
1. Custody Seals Present	☑		☐
2. Custody Seals Intact	☑		☐
3. Temp criteria achieved	☑		☐
4. Cooler temp verification	IR Gun		
5. Cooler media	Ice (Bag)		

Trip Blank Information	Y	or	N	N/A
1. Trip Blank present / cooler	☐		☑	☐
2. Trip Blank listed on COC	☐		☑	☐

	W	or	S	N/A
3. Type Of TB Received	☐		☐	☑

Sample Information	Y	or	N	N/A
1. Sample labels present on bottles	☑		☐	
2. Samples preserved properly	☑		☐	
3. Sufficient volume/containers recvd for analysis:	☑		☐	
4. Condition of sample	Intact			
5. Sample recvd within HT	☑		☐	
6. Dates/Times/IDs on COC match Sample Label	☑		☐	
7. VOCs have headspace	☐		☐	☑
8. Bottles received for unspecified tests	☐		☑	
9. Compositing instructions clear	☐		☐	☑
10. Voa Soil Kits/Jars received past 48hrs?	☐		☐	☑
11. % Solids Jar received?	☐		☐	☑
12. Residual Chlorine Present?	☐		☐	☑

Misc. Information

Number of Encores: 25-Gram _____ 5-Gram _____ Number of 5035 Field Kits: _____ Number of Lab Filtered Metals: _____

Test Strip Lot #s: pH 0-3 230315 pH 10-12 219813A Other: (Specify) _____ _____

Residual Chlorine Test Strip Lot #: _____

Comments

SM001
Rev. Date 05/24/17

Technician: TRIINITYM Date: 9/21/2019 9:14:00 AM Reviewer: _____ Date: _____

FA68283: Chain of Custody
Page 2 of 2

MS Semi-volatiles

QC Data Summaries

Includes the following where applicable:

- Method Blank Summaries
- Blank Spike Summaries
- Matrix Spike and Duplicate Summaries

Method Blank Summary

Job Number: FA68283
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP76990-MB	3Q9926.D	1	09/27/19	NG	09/25/19	OP76990	S3Q176

The QC reported here applies to the following samples: **Method:** EPA 537M BY ID

FA68283-1, FA68283-2, FA68283-3, FA68283-5, FA68283-6

CAS No.	Compound	Result	RL	MDL	Units	Q
375-22-4	Perfluorobutanoic acid	ND	0.015	0.0038	ug/l	
2706-90-3	Perfluoropentanoic acid	ND	0.0077	0.0029	ug/l	
307-24-4	Perfluorohexanoic acid	ND	0.0077	0.0019	ug/l	
375-85-9	Perfluoroheptanoic acid	ND	0.0077	0.0019	ug/l	
335-67-1	Perfluorooctanoic acid	ND	0.0077	0.0019	ug/l	
375-95-1	Perfluorononanoic acid	ND	0.0077	0.0019	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.0077	0.0019	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0077	0.0019	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0077	0.0029	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0077	0.0019	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0077	0.0019	ug/l	
375-73-5	Perfluorobutanesulfonic acid	ND	0.0077	0.0019	ug/l	
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0077	0.0019	ug/l	
355-46-4	Perfluorohexanesulfonic acid	ND	0.0077	0.0019	ug/l	
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0077	0.0019	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	ND	0.0077	0.0029	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0077	0.0019	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0077	0.0019	ug/l	
754-91-6	PFOSA	ND	0.0077	0.0019	ug/l	
2355-31-9	MeFOSAA	ND	0.038	0.0077	ug/l	
2991-50-6	EtFOSAA	ND	0.038	0.0077	ug/l	
757124-72-4	4:2 Fluorotelomer sulfonate	ND	0.015	0.0038	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.015	0.0038	ug/l	
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.015	0.0038	ug/l	

CAS No.	ID Standard Recoveries		Limits
	13C4-PFBA	86%	30-140%
	13C5-PFPeA	94%	40-140%
	13C5-PFHxA	92%	50-150%
	13C4-PFHpA	90%	50-150%
	13C8-PFOA	92%	50-150%
	13C9-PFNA	92%	50-150%
	13C6-PFDA	81%	50-150%
	13C7-PFUnDA	82%	50-150%

Method Blank Summary

Job Number: FA68283
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP76990-MB	3Q9926.D	1	09/27/19	NG	09/25/19	OP76990	S3Q176

The QC reported here applies to the following samples: **Method:** EPA 537M BY ID

FA68283-1, FA68283-2, FA68283-3, FA68283-5, FA68283-6

CAS No.	ID Standard Recoveries		Limits
	13C2-PFDoDA	89%	50-150%
	13C2-PFTeDA	118%	40-150%
	13C3-PFBS	87%	50-150%
	13C3-PFHxS	83%	50-150%
	13C8-PFOS	87%	50-150%
	13C8-FOSA	81%	30-140%
	d3-MeFOSAA	103%	50-150%
	13C2-4:2FTS	85%	50-150%
	13C2-6:2FTS	80%	50-150%
	13C2-8:2FTS	70%	50-150%

Method Blank Summary

Job Number: FA68283
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP77080-MB	3Q10099.D	1	10/03/19	NG	10/01/19	OP77080	S3Q179

The QC reported here applies to the following samples: **Method:** EPA 537M BY ID

FA68283-4

CAS No.	Compound	Result	RL	MDL	Units	Q
375-22-4	Perfluorobutanoic acid	ND	0.0080	0.0020	ug/l	
2706-90-3	Perfluoropentanoic acid	ND	0.0040	0.0015	ug/l	
307-24-4	Perfluorohexanoic acid	ND	0.0040	0.0010	ug/l	
375-85-9	Perfluoroheptanoic acid	ND	0.0040	0.0010	ug/l	
335-67-1	Perfluorooctanoic acid	ND	0.0040	0.0010	ug/l	
375-95-1	Perfluorononanoic acid	ND	0.0040	0.0010	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.0040	0.0010	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0040	0.0010	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0040	0.0015	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0040	0.0010	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0040	0.0010	ug/l	
375-73-5	Perfluorobutanesulfonic acid	ND	0.0040	0.0010	ug/l	
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0040	0.0010	ug/l	
355-46-4	Perfluorohexanesulfonic acid	ND	0.0040	0.0010	ug/l	
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0040	0.0010	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	ND	0.0040	0.0015	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0040	0.0010	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0040	0.0010	ug/l	
754-91-6	PFOSA	ND	0.0040	0.0010	ug/l	
2355-31-9	MeFOSAA	ND	0.020	0.0040	ug/l	
2991-50-6	EtFOSAA	ND	0.020	0.0040	ug/l	
757124-72-4	4:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.0080	0.0020	ug/l	

CAS No.	ID Standard Recoveries		Limits
	13C4-PFBA	88%	30-140%
	13C5-PFPeA	87%	40-140%
	13C5-PFHxA	87%	50-150%
	13C4-PFHpA	90%	50-150%
	13C8-PFOA	92%	50-150%
	13C9-PFNA	95%	50-150%
	13C6-PFDA	94%	50-150%
	13C7-PFUnDA	85%	50-150%

Method Blank Summary

Job Number: FA68283
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP77080-MB	3Q10099.D	1	10/03/19	NG	10/01/19	OP77080	S3Q179

The QC reported here applies to the following samples: **Method:** EPA 537M BY ID

FA68283-4

CAS No.	ID Standard Recoveries		Limits
	13C2-PFDoDA	82%	50-150%
	13C2-PFTeDA	91%	40-150%
	13C3-PFBS	83%	50-150%
	13C3-PFHxS	84%	50-150%
	13C8-PFOS	87%	50-150%
	13C8-FOSA	99%	30-140%
	d3-MeFOSAA	89%	50-150%
	13C2-4:2FTS	80%	50-150%
	13C2-6:2FTS	85%	50-150%
	13C2-8:2FTS	83%	50-150%
	13C3-HFPO-DA	78%	50-150%

Instrument Blank

Job Number: FA68283
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
S3Q176-IBLK	3Q9789.D	1	09/26/19	NG	n/a	n/a	S3Q176

The QC reported here applies to the following samples: **Method:** EPA 537M QSM5.1 B-15

FA68283-1, FA68283-2, FA68283-3, FA68283-5, FA68283-6

CAS No.	Compound	Result	RL	MDL	Units	Q
375-22-4	Perfluorobutanoic acid	ND	0.016	0.0040	ug/l	
2706-90-3	Perfluoropentanoic acid	ND	0.0080	0.0030	ug/l	
307-24-4	Perfluorohexanoic acid	ND	0.0080	0.0020	ug/l	
375-85-9	Perfluoroheptanoic acid	ND	0.0080	0.0020	ug/l	
335-67-1	Perfluorooctanoic acid	ND	0.0080	0.0020	ug/l	
375-95-1	Perfluorononanoic acid	ND	0.0080	0.0020	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.0080	0.0020	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0080	0.0020	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0080	0.0030	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0080	0.0020	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0080	0.0020	ug/l	
375-73-5	Perfluorobutanesulfonic acid	ND	0.0080	0.0020	ug/l	
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0080	0.0020	ug/l	
355-46-4	Perfluorohexanesulfonic acid	ND	0.0080	0.0020	ug/l	
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0080	0.0020	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	ND	0.0080	0.0030	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0080	0.0020	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0080	0.0020	ug/l	
754-91-6	PFOSA	ND	0.0080	0.0020	ug/l	
2355-31-9	MeFOSAA	ND	0.040	0.0080	ug/l	
2991-50-6	EtFOSAA	ND	0.040	0.0080	ug/l	
757124-72-4	4:2 Fluorotelomer sulfonate	ND	0.016	0.0040	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.016	0.0040	ug/l	
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.016	0.0040	ug/l	

CAS No.	ID Standard Recoveries		Limits
	13C4-PFBA	78%	50-150%
	13C5-PFPeA	83%	50-150%
	13C5-PFHxA	81%	50-150%
	13C4-PFHpA	82%	50-150%
	13C8-PFOA	83%	50-150%
	13C9-PFNA	87%	50-150%
	13C6-PFDA	85%	50-150%
	13C7-PFUnDA	84%	50-150%

Instrument Blank

Job Number: FA68283
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
S3Q176-IBLK	3Q9789.D	1	09/26/19	NG	n/a	n/a	S3Q176

The QC reported here applies to the following samples: **Method:** EPA 537M QSM5.1 B-15

FA68283-1, FA68283-2, FA68283-3, FA68283-5, FA68283-6

CAS No.	ID Standard Recoveries		Limits
	13C2-PFDoDA	89%	50-150%
	13C2-PFTeDA	118%	50-150%
	13C3-PFBS	82%	50-150%
	13C3-PFHxS	82%	50-150%
	13C8-PFOS	88%	50-150%
	13C8-FOSA	92%	50-150%
	d3-MeFOSAA	83%	50-150%
	13C2-4:2FTS	74%	50-150%
	13C2-6:2FTS	75%	50-150%
	13C2-8:2FTS	73%	50-150%
	13C3-HFPO-DA	87%	50-150%

Instrument Blank

Job Number: FA68283
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
S3Q179-IBLK	3Q10043.D	1	10/02/19	NG	n/a	n/a	S3Q179

The QC reported here applies to the following samples: **Method:** EPA 537M QSM5.1 B-15

FA68283-4

CAS No.	Compound	Result	RL	MDL	Units	Q
375-22-4	Perfluorobutanoic acid	ND	0.016	0.0040	ug/l	
2706-90-3	Perfluoropentanoic acid	ND	0.0080	0.0030	ug/l	
307-24-4	Perfluorohexanoic acid	ND	0.0080	0.0020	ug/l	
375-85-9	Perfluoroheptanoic acid	ND	0.0080	0.0020	ug/l	
335-67-1	Perfluorooctanoic acid	ND	0.0080	0.0020	ug/l	
375-95-1	Perfluorononanoic acid	ND	0.0080	0.0020	ug/l	
335-76-2	Perfluorodecanoic acid	ND	0.0080	0.0020	ug/l	
2058-94-8	Perfluoroundecanoic acid	ND	0.0080	0.0020	ug/l	
307-55-1	Perfluorododecanoic acid	ND	0.0080	0.0030	ug/l	
72629-94-8	Perfluorotridecanoic acid	ND	0.0080	0.0020	ug/l	
376-06-7	Perfluorotetradecanoic acid	ND	0.0080	0.0020	ug/l	
375-73-5	Perfluorobutanesulfonic acid	ND	0.0080	0.0020	ug/l	
2706-91-4	Perfluoropentanesulfonic acid	ND	0.0080	0.0020	ug/l	
355-46-4	Perfluorohexanesulfonic acid	ND	0.0080	0.0020	ug/l	
375-92-8	Perfluoroheptanesulfonic acid	ND	0.0080	0.0020	ug/l	
1763-23-1	Perfluorooctanesulfonic acid	ND	0.0080	0.0030	ug/l	
68259-12-1	Perfluorononanesulfonic acid	ND	0.0080	0.0020	ug/l	
335-77-3	Perfluorodecanesulfonic acid	ND	0.0080	0.0020	ug/l	
754-91-6	PFOSA	ND	0.0080	0.0020	ug/l	
2355-31-9	MeFOSAA	ND	0.040	0.0080	ug/l	
2991-50-6	EtFOSAA	ND	0.040	0.0080	ug/l	
757124-72-4	4:2 Fluorotelomer sulfonate	ND	0.016	0.0040	ug/l	
27619-97-2	6:2 Fluorotelomer sulfonate	ND	0.016	0.0040	ug/l	
39108-34-4	8:2 Fluorotelomer sulfonate	ND	0.016	0.0040	ug/l	

CAS No.	ID Standard Recoveries		Limits
	13C4-PFBA	92%	50-150%
	13C5-PFPeA	94%	50-150%
	13C5-PFHxA	94%	50-150%
	13C4-PFHpA	96%	50-150%
	13C8-PFOA	98%	50-150%
	13C9-PFNA	100%	50-150%
	13C6-PFDA	102%	50-150%
	13C7-PFUnDA	102%	50-150%

Instrument Blank

Job Number: FA68283
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
S3Q179-IBLK	3Q10043.D	1	10/02/19	NG	n/a	n/a	S3Q179

The QC reported here applies to the following samples: **Method:** EPA 537M QSM5.1 B-15

FA68283-4

CAS No.	ID Standard Recoveries		Limits
	13C2-PFDoDA	101%	50-150%
	13C2-PFTeDA	108%	50-150%
	13C3-PFBS	92%	50-150%
	13C3-PFHxS	93%	50-150%
	13C8-PFOS	95%	50-150%
	13C8-FOSA	97%	50-150%
	d3-MeFOSAA	101%	50-150%
	13C2-4:2FTS	88%	50-150%
	13C2-6:2FTS	92%	50-150%
	13C2-8:2FTS	93%	50-150%
	13C3-HFPO-DA	94%	50-150%

Blank Spike Summary

Job Number: FA68283
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP76990-BS	3Q9925.D	1	09/27/19	NG	09/25/19	OP76990	S3Q176

The QC reported here applies to the following samples: **Method:** EPA 537M BY ID

FA68283-1, FA68283-2, FA68283-3, FA68283-5, FA68283-6

CAS No.	Compound	Spike ug/l	BSP ug/l	BSP %	Limits
375-22-4	Perfluorobutanoic acid	0.154	0.169	110	70-130
2706-90-3	Perfluoropentanoic acid	0.154	0.152	99	70-130
307-24-4	Perfluorohexanoic acid	0.154	0.162	105	70-130
375-85-9	Perfluoroheptanoic acid	0.154	0.158	103	71-130
335-67-1	Perfluorooctanoic acid	0.154	0.154	100	74-130
375-95-1	Perfluorononanoic acid	0.154	0.157	102	76-130
335-76-2	Perfluorodecanoic acid	0.154	0.167	109	70-130
2058-94-8	Perfluoroundecanoic acid	0.154	0.162	105	70-130
307-55-1	Perfluorododecanoic acid	0.154	0.160	104	70-130
72629-94-8	Perfluorotridecanoic acid	0.154	0.131	85	70-139
376-06-7	Perfluorotetradecanoic acid	0.154	0.156	101	70-130
375-73-5	Perfluorobutanesulfonic acid	0.154	0.165	107	73-130
2706-91-4	Perfluoropentanesulfonic acid	0.154	0.168	109	70-130
355-46-4	Perfluorohexanesulfonic acid	0.154	0.163	106	74-130
375-92-8	Perfluoroheptanesulfonic acid	0.154	0.168	109	74-130
1763-23-1	Perfluorooctanesulfonic acid	0.154	0.158	103	70-130
68259-12-1	Perfluorononanesulfonic acid	0.154	0.161	105	70-130
335-77-3	Perfluorodecanesulfonic acid	0.154	0.168	109	70-130
754-91-6	PFOSA	0.154	0.159	103	70-131
2355-31-9	MeFOSAA	0.154	0.166	108	70-130
2991-50-6	EtFOSAA	0.154	0.153	99	70-130
757124-72-4	4:2 Fluorotelomer sulfonate	0.154	0.159	103	70-130
27619-97-2	6:2 Fluorotelomer sulfonate	0.154	0.158	103	70-133
39108-34-4	8:2 Fluorotelomer sulfonate	0.154	0.165	107	70-130

CAS No.	ID Standard Recoveries	BSP	Limits
	13C4-PFBA	87%	30-140%
	13C5-PFPeA	95%	40-140%
	13C5-PFHxA	93%	50-150%
	13C4-PFHpA	92%	50-150%
	13C8-PFOA	94%	50-150%
	13C9-PFNA	95%	50-150%
	13C6-PFDA	83%	50-150%
	13C7-PFUnDA	83%	50-150%

* = Outside of Control Limits.

Blank Spike Summary

Job Number: FA68283
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP76990-BS	3Q9925.D	1	09/27/19	NG	09/25/19	OP76990	S3Q176

The QC reported here applies to the following samples: **Method:** EPA 537M BY ID

FA68283-1, FA68283-2, FA68283-3, FA68283-5, FA68283-6

CAS No.	ID Standard Recoveries	BSP	Limits
	13C2-PFDoDA	88%	50-150%
	13C2-PFTeDA	119%	40-150%
	13C3-PFBS	89%	50-150%
	13C3-PFHxS	86%	50-150%
	13C8-PFOS	86%	50-150%
	13C8-FOSA	79%	30-140%
	d3-MeFOSAA	90%	50-150%
	13C2-4:2FTS	91%	50-150%
	13C2-6:2FTS	87%	50-150%
	13C2-8:2FTS	76%	50-150%

* = Outside of Control Limits.

Blank Spike Summary

Job Number: FA68283
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP77080-BS	3Q10098.D	1	10/02/19	NG	10/01/19	OP77080	S3Q179

The QC reported here applies to the following samples: **Method:** EPA 537M BY ID

FA68283-4

CAS No.	Compound	Spike ug/l	BSP ug/l	BSP %	Limits
375-22-4	Perfluorobutanoic acid	0.08	0.0821	103	70-130
2706-90-3	Perfluoropentanoic acid	0.08	0.0855	107	70-130
307-24-4	Perfluorohexanoic acid	0.08	0.0842	105	70-130
375-85-9	Perfluoroheptanoic acid	0.08	0.0833	104	71-130
335-67-1	Perfluorooctanoic acid	0.08	0.0845	106	74-130
375-95-1	Perfluorononanoic acid	0.08	0.0870	109	76-130
335-76-2	Perfluorodecanoic acid	0.08	0.0856	107	70-130
2058-94-8	Perfluoroundecanoic acid	0.08	0.0843	105	70-130
307-55-1	Perfluorododecanoic acid	0.08	0.0865	108	70-130
72629-94-8	Perfluorotridecanoic acid	0.08	0.0847	106	70-139
376-06-7	Perfluorotetradecanoic acid	0.08	0.0870	109	70-130
375-73-5	Perfluorobutanesulfonic acid	0.08	0.0855	107	73-130
2706-91-4	Perfluoropentanesulfonic acid	0.08	0.0849	106	70-130
355-46-4	Perfluorohexanesulfonic acid	0.08	0.0848	106	74-130
375-92-8	Perfluoroheptanesulfonic acid	0.08	0.0886	111	74-130
1763-23-1	Perfluorooctanesulfonic acid	0.08	0.0841	105	70-130
68259-12-1	Perfluorononanesulfonic acid	0.08	0.0867	108	70-130
335-77-3	Perfluorodecanesulfonic acid	0.08	0.0813	102	70-130
754-91-6	PFOSA	0.08	0.0847	106	70-131
2355-31-9	MeFOSAA	0.08	0.0871	109	70-130
2991-50-6	EtFOSAA	0.08	0.0848	106	70-130
757124-72-4	4:2 Fluorotelomer sulfonate	0.08	0.0842	105	70-130
27619-97-2	6:2 Fluorotelomer sulfonate	0.08	0.0812	102	70-133
39108-34-4	8:2 Fluorotelomer sulfonate	0.08	0.0834	104	70-130

CAS No.	ID Standard Recoveries	BSP	Limits
	13C4-PFBA	93%	30-140%
	13C5-PFPeA	92%	40-140%
	13C5-PFHxA	91%	50-150%
	13C4-PFHpA	95%	50-150%
	13C8-PFOA	96%	50-150%
	13C9-PFNA	99%	50-150%
	13C6-PFDA	98%	50-150%
	13C7-PFUnDA	91%	50-150%

* = Outside of Control Limits.

Blank Spike Summary

Job Number: FA68283
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP77080-BS	3Q10098.D	1	10/02/19	NG	10/01/19	OP77080	S3Q179

The QC reported here applies to the following samples: **Method:** EPA 537M BY ID

FA68283-4

CAS No.	ID Standard Recoveries	BSP	Limits
	13C2-PFDoDA	89%	50-150%
	13C2-PFTeDA	97%	40-150%
	13C3-PFBS	90%	50-150%
	13C3-PFHxS	90%	50-150%
	13C8-PFOS	92%	50-150%
	13C8-FOSA	75%	30-140%
	d3-MeFOSAA	95%	50-150%
	13C2-4:2FTS	92%	50-150%
	13C2-6:2FTS	96%	50-150%
	13C2-8:2FTS	93%	50-150%
	13C3-HFPO-DA	86%	50-150%

* = Outside of Control Limits.

Matrix Spike Summary

Job Number: FA68283
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP76990-MS	3Q9928.D	1	09/27/19	NG	09/25/19	OP76990	S3Q176
FA68283-1	3Q9927.D	1	09/27/19	NG	09/25/19	OP76990	S3Q176

The QC reported here applies to the following samples: **Method:** EPA 537M BY ID

FA68283-1, FA68283-2, FA68283-3, FA68283-5, FA68283-6

CAS No.	Compound	FA68283-1 ug/l	Q	Spike ug/l	MS ug/l	MS %	Limits
375-22-4	Perfluorobutanoic acid	ND		0.154	0.171	111	70-130
2706-90-3	Perfluoropentanoic acid	ND		0.154	0.155	101	70-130
307-24-4	Perfluorohexanoic acid	ND		0.154	0.164	107	70-130
375-85-9	Perfluoroheptanoic acid	ND		0.154	0.160	104	71-130
335-67-1	Perfluorooctanoic acid	ND		0.154	0.158	103	74-130
375-95-1	Perfluorononanoic acid	ND		0.154	0.161	105	76-130
335-76-2	Perfluorodecanoic acid	ND		0.154	0.171	111	70-130
2058-94-8	Perfluoroundecanoic acid	ND		0.154	0.162	105	70-130
307-55-1	Perfluorododecanoic acid	ND		0.154	0.162	105	70-130
72629-94-8	Perfluorotridecanoic acid	ND		0.154	0.135	88	70-139
376-06-7	Perfluorotetradecanoic acid	ND		0.154	0.157	102	70-130
375-73-5	Perfluorobutanesulfonic acid	ND		0.154	0.168	109	73-130
2706-91-4	Perfluoropentanesulfonic acid	ND		0.154	0.176	114	70-130
355-46-4	Perfluorohexanesulfonic acid	ND		0.154	0.166	108	74-130
375-92-8	Perfluoroheptanesulfonic acid	ND		0.154	0.172	112	74-130
1763-23-1	Perfluorooctanesulfonic acid	ND		0.154	0.162	105	70-130
68259-12-1	Perfluorononanesulfonic acid	ND		0.154	0.163	106	70-130
335-77-3	Perfluorodecanesulfonic acid	ND		0.154	0.167	109	70-130
754-91-6	PFOSA	ND		0.154	0.160	104	70-131
2355-31-9	MeFOSAA	ND		0.154	0.166	108	70-130
2991-50-6	EtFOSAA	ND		0.154	0.164	107	70-130
757124-72-4	4:2 Fluorotelomer sulfonate	ND		0.154	0.162	105	70-130
27619-97-2	6:2 Fluorotelomer sulfonate	ND		0.154	0.161	105	70-133
39108-34-4	8:2 Fluorotelomer sulfonate	ND		0.154	0.163	106	70-130

CAS No.	ID Standard Recoveries	MS	FA68283-1	Limits
	13C4-PFBA	83%	86%	30-140%
	13C5-PFPeA	94%	98%	40-140%
	13C5-PFHxA	92%	97%	50-150%
	13C4-PFHpA	91%	95%	50-150%
	13C8-PFOA	93%	99%	50-150%
	13C9-PFNA	96%	100%	50-150%
	13C6-PFDA	85%	87%	50-150%
	13C7-PFUnDA	88%	90%	50-150%

* = Outside of Control Limits.

Matrix Spike Summary

Job Number: FA68283
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP76990-MS	3Q9928.D	1	09/27/19	NG	09/25/19	OP76990	S3Q176
FA68283-1	3Q9927.D	1	09/27/19	NG	09/25/19	OP76990	S3Q176

The QC reported here applies to the following samples: **Method:** EPA 537M BY ID

FA68283-1, FA68283-2, FA68283-3, FA68283-5, FA68283-6

CAS No.	ID Standard Recoveries	MS	FA68283-1	Limits
	13C2-PFDoDA	93%	93%	50-150%
	13C2-PFTeDA	125%	129%	40-150%
	13C3-PFBS	87%	91%	50-150%
	13C3-PFHxS	86%	90%	50-150%
	13C8-PFOS	90%	93%	50-150%
	13C8-FOSA	78%	87%	30-140%
	d3-MeFOSAA	93%	135%	50-150%
	13C2-4:2FTS	90%	88%	50-150%
	13C2-6:2FTS	87%	85%	50-150%
	13C2-8:2FTS	79%	74%	50-150%

* = Outside of Control Limits.

Matrix Spike Summary

Job Number: FA68283
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP77080-MS	3Q10107.D	2	10/03/19	NG	10/01/19	OP77080	S3Q179
JC95622-1 [a]	3Q10106.D	2	10/03/19	NG	10/01/19	OP77080	S3Q179

The QC reported here applies to the following samples: **Method:** EPA 537M BY ID

FA68283-4

CAS No.	Compound	JC95622-1 ug/l	Q	Spike ug/l	MS ug/l	MS %	Limits
375-22-4	Perfluorobutanoic acid	0.143		0.08	0.199	70	70-130
2706-90-3	Perfluoropentanoic acid	0.0807		0.08	0.172	114	70-130
307-24-4	Perfluorohexanoic acid	0.0908		0.08	0.182	114	70-130
375-85-9	Perfluoroheptanoic acid	0.0861		0.08	0.181	119	71-130
335-67-1	Perfluorooctanoic acid	0.217		0.08	0.321	130	74-130
375-95-1	Perfluorononanoic acid	0.0226		0.08	0.110	109	76-130
335-76-2	Perfluorodecanoic acid	ND		0.08	0.0864	108	70-130
2058-94-8	Perfluoroundecanoic acid	ND		0.08	0.0844	106	70-130
307-55-1	Perfluorododecanoic acid	ND		0.08	0.0868	109	70-130
72629-94-8	Perfluorotridecanoic acid	ND		0.08	0.0992	124	70-139
376-06-7	Perfluorotetradecanoic acid	ND		0.08	0.0933	117	70-130
375-73-5	Perfluorobutanesulfonic acid	0.0864		0.08	0.184	122	73-130
2706-91-4	Perfluoropentanesulfonic acid	ND		0.08	0.104	130	70-130
355-46-4	Perfluorohexanesulfonic acid	0.0833		0.08	0.177	117	74-130
375-92-8	Perfluoroheptanesulfonic acid	0.0200		0.08	0.112	115	74-130
1763-23-1	Perfluorooctanesulfonic acid	0.197		0.08	0.300	129	70-130
68259-12-1	Perfluorononanesulfonic acid	ND		0.08	0.0942	118	70-130
335-77-3	Perfluorodecanesulfonic acid	ND		0.08	0.0663	83	70-130
754-91-6	PFOSA	ND		0.08	0.0871	109	70-131
2355-31-9	MeFOSAA	ND		0.08	0.0883	110	70-130
2991-50-6	EtFOSAA	ND		0.08	0.0821	103	70-130
757124-72-4	4:2 Fluorotelomer sulfonate	ND		0.08	0.0839	105	70-130
27619-97-2	6:2 Fluorotelomer sulfonate	0.00376	J	0.08	0.0853	102	70-133
39108-34-4	8:2 Fluorotelomer sulfonate	ND		0.08	0.0849	106	70-130

CAS No.	ID Standard Recoveries	MS	JC95622-1	Limits
	13C4-PFBA	23%* [b]		30-140%
	13C5-PFPeA	54%		40-140%
	13C5-PFHxA	51%		50-150%
	13C4-PFHpA	55%		50-150%
	13C8-PFOA	64%	65%	50-150%
	13C9-PFNA	73%		50-150%
	13C6-PFDA	84%		50-150%
	13C7-PFUnDA	84%		50-150%

* = Outside of Control Limits.

Matrix Spike Summary

Job Number: FA68283
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP77080-MS	3Q10107.D	2	10/03/19	NG	10/01/19	OP77080	S3Q179
JC95622-1 [a]	3Q10106.D	2	10/03/19	NG	10/01/19	OP77080	S3Q179

The QC reported here applies to the following samples: **Method:** EPA 537M BY ID

FA68283-4

CAS No.	ID Standard Recoveries	MS	JC95622-1	Limits
	13C2-PFDoDA	80%		50-150%
	13C2-PFTeDA	64%		40-150%
	13C3-PFBS	65%		50-150%
	13C3-PFHxS	67%		50-150%
	13C8-PFOS	66%	68%	50-150%
	13C8-FOSA	7%* [b]		30-140%
	d3-MeFOSAA	84%		50-150%
	13C2-4:2FTS	66%		50-150%
	13C2-6:2FTS	91%		50-150%
	13C2-8:2FTS	99%		50-150%
	13C3-HFPO-DA	0%*		50-150%

(a) Dilution required due to matrix interference (internal standard failure).
(b) Outside control limits.

* = Outside of Control Limits.

Duplicate Summary

Job Number: FA68283
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP76990-DUP	3Q9930.D	1	09/27/19	NG	09/25/19	OP76990	S3Q176
FA68283-2	3Q9929.D	1	09/27/19	NG	09/25/19	OP76990	S3Q176

The QC reported here applies to the following samples: **Method:** EPA 537M BY ID

FA68283-1, FA68283-2, FA68283-3, FA68283-5, FA68283-6

CAS No.	Compound	FA68283-2 ug/l	Q	DUP ug/l	Q	RPD	Limits
375-22-4	Perfluorobutanoic acid	ND		ND		nc	30
2706-90-3	Perfluoropentanoic acid	ND		ND		nc	30
307-24-4	Perfluorohexanoic acid	ND		ND		nc	30
375-85-9	Perfluoroheptanoic acid	ND		ND		nc	30
335-67-1	Perfluorooctanoic acid	ND		ND		nc	30
375-95-1	Perfluorononanoic acid	ND		ND		nc	30
335-76-2	Perfluorodecanoic acid	ND		ND		nc	30
2058-94-8	Perfluoroundecanoic acid	ND		ND		nc	30
307-55-1	Perfluorododecanoic acid	ND		ND		nc	30
72629-94-8	Perfluorotridecanoic acid	ND		ND		nc	30
376-06-7	Perfluorotetradecanoic acid	ND		ND		nc	30
375-73-5	Perfluorobutanesulfonic acid	0.00198	J	ND		200*	30
2706-91-4	Perfluoropentanesulfonic acid	ND		ND		nc	30
355-46-4	Perfluorohexanesulfonic acid	ND		ND		nc	30
375-92-8	Perfluoroheptanesulfonic acid	ND		ND		nc	30
1763-23-1	Perfluorooctanesulfonic acid	ND		ND		nc	30
68259-12-1	Perfluorononanesulfonic acid	ND		ND		nc	30
335-77-3	Perfluorodecanesulfonic acid	ND		ND		nc	30
754-91-6	PFOSA	ND		ND		nc	30
2355-31-9	MeFOSAA	ND		ND		nc	30
2991-50-6	EtFOSAA	ND		ND		nc	30
757124-72-4	4:2 Fluorotelomer sulfonate	ND		ND		nc	30
27619-97-2	6:2 Fluorotelomer sulfonate	ND		ND		nc	30
39108-34-4	8:2 Fluorotelomer sulfonate	ND		ND		nc	30

CAS No.	ID Standard Recoveries	DUP	FA68283-2	Limits
	13C4-PFBA	76%	84%	30-140%
	13C5-PFPeA	87%	96%	40-140%
	13C5-PFHxA	85%	93%	50-150%
	13C4-PFHpA	84%	91%	50-150%
	13C8-PFOA	87%	94%	50-150%
	13C9-PFNA	89%	95%	50-150%
	13C6-PFDA	79%	84%	50-150%
	13C7-PFUnDA	82%	87%	50-150%

* = Outside of Control Limits.

Duplicate Summary

Job Number: FA68283
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP76990-DUP	3Q9930.D	1	09/27/19	NG	09/25/19	OP76990	S3Q176
FA68283-2	3Q9929.D	1	09/27/19	NG	09/25/19	OP76990	S3Q176

The QC reported here applies to the following samples: **Method:** EPA 537M BY ID

FA68283-1, FA68283-2, FA68283-3, FA68283-5, FA68283-6

CAS No.	ID Standard Recoveries	DUP	FA68283-2	Limits
	13C2-PFDoDA	85%	90%	50-150%
	13C2-PFTeDA	119%	125%	40-150%
	13C3-PFBS	80%	87%	50-150%
	13C3-PFHxS	78%	85%	50-150%
	13C8-PFOS	82%	87%	50-150%
	13C8-FOSA	78%	82%	30-140%
	d3-MeFOSAA	86%	83%	50-150%
	13C2-4:2FTS	77%	85%	50-150%
	13C2-6:2FTS	76%	82%	50-150%
	13C2-8:2FTS	66%	71%	50-150%

* = Outside of Control Limits.

Duplicate Summary

Job Number: FA68283
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP77080-DUP	3Q10154.D	1	10/03/19	NG	10/01/19	OP77080	S3Q179
JC95622-2	3Q10153.D	1	10/03/19	NG	10/01/19	OP77080	S3Q179

The QC reported here applies to the following samples: **Method:** EPA 537M BY ID

FA68283-4

CAS No.	Compound	JC95622-2 ug/l	Q	DUP ug/l	Q	RPD	Limits
375-22-4	Perfluorobutanoic acid	0.0521		0.0486		7	30
2706-90-3	Perfluoropentanoic acid	0.0523		0.0517		1	30
307-24-4	Perfluorohexanoic acid	0.0630		0.0622		1	30
375-85-9	Perfluoroheptanoic acid	0.0548		0.0542		1	30
335-67-1	Perfluorooctanoic acid	0.258		0.255		1	30
375-95-1	Perfluorononanoic acid	0.0111		0.0111		0	30
335-76-2	Perfluorodecanoic acid	0.00173	J	0.00170	J	2	30
2058-94-8	Perfluoroundecanoic acid	ND		ND		nc	30
307-55-1	Perfluorododecanoic acid	ND		ND		nc	30
72629-94-8	Perfluorotridecanoic acid	ND		ND		nc	30
376-06-7	Perfluorotetradecanoic acid	ND		ND		nc	30
375-73-5	Perfluorobutanesulfonic acid	0.0501		0.0462		8	30
2706-91-4	Perfluoropentanesulfonic acid	ND		ND		nc	30
355-46-4	Perfluorohexanesulfonic acid	0.0647		0.0646		0	30
375-92-8	Perfluoroheptanesulfonic acid	0.00826		0.00790		4	30
1763-23-1	Perfluorooctanesulfonic acid	0.141		0.142		1	30
68259-12-1	Perfluorononanesulfonic acid	ND		ND		nc	30
335-77-3	Perfluorodecanesulfonic acid	ND		ND		nc	30
754-91-6	PFOSA	ND		ND		nc	30
2355-31-9	MeFOSAA	ND		ND		nc	30
2991-50-6	EtFOSAA	ND		ND		nc	30
757124-72-4	4:2 Fluorotelomer sulfonate	ND		ND		nc	30
27619-97-2	6:2 Fluorotelomer sulfonate	ND		ND		nc	30
39108-34-4	8:2 Fluorotelomer sulfonate	ND		ND		nc	30

CAS No.	ID Standard Recoveries	DUP	JC95622-2	Limits
	13C4-PFBA	43%		30-140%
	13C5-PFPeA	60%		40-140%
	13C5-PFHxA	61%		50-150%
	13C4-PFHpA	66%		50-150%
	13C8-PFOA	75%	79%	50-150%
	13C9-PFNA	83%		50-150%
	13C6-PFDA	76%		50-150%
	13C7-PFUnDA	70%		50-150%

* = Outside of Control Limits.

Duplicate Summary

Job Number: FA68283
Account: ARCMIL Arcadis
Project: Racer Lansing PFAS Delineation; Lansing, MI

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
OP77080-DUP	3Q10154.D	1	10/03/19	NG	10/01/19	OP77080	S3Q179
JC95622-2	3Q10153.D	1	10/03/19	NG	10/01/19	OP77080	S3Q179

The QC reported here applies to the following samples: **Method:** EPA 537M BY ID

FA68283-4

CAS No.	ID Standard Recoveries	DUP	JC95622-2	Limits
	13C2-PFDoDA	70%		50-150%
	13C2-PFTeDA	96%		40-150%
	13C3-PFBS	65%		50-150%
	13C3-PFHxS	68%		50-150%
	13C8-PFOS	67%	73%	50-150%
	13C8-FOSA	17%* [a]		30-140%
	d3-MeFOSAA	41%* [a]		50-150%
	13C2-4:2FTS	71%		50-150%
	13C2-6:2FTS	91%		50-150%
	13C2-8:2FTS	96%		50-150%
	13C3-HFPO-DA	0%*		50-150%

(a) Outside control limits.

* = Outside of Control Limits.