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October 6, 2021  
File No. 20.0157080.00

Mr. Kevin D. McKnight, Advanced Hydrogeologist  
Wisconsin Department of Natural Resources  
625 East County Road Y, Suite 700  
Oshkosh, Wisconsin 54901-9731

Re: Preliminary Soil and Groundwater Analytical Results  
Oshkosh Defense LLC - Waukau Lot and West Plant Sites  
WDNR BRRTS #02-71-587405 and #02-71-587406

Dear Mr. McKnight:

On September 30, 2021, representatives of GZA GeoEnvironmental, Inc. (GZA), Oshkosh Defense, LLC (Oshkosh), and the Wisconsin Department of Natural Resources (WDNR) participated in a virtual meeting to discuss the per- and polyfluoroalkyl substance (PFAS) results of recent soil and groundwater samples collected at the Waukau Lot (BRRTS #02-71-587405) and West Plant (BRRTS #02-71-587406) sites. Figure 1 shows the locations of the soil borings and monitoring well at the Waukau Lot site and Figures 2 and 3 show the locations of the monitoring well and soil borings at the West Plant site. Following a period of internal data quality review, GZA, on behalf of Oshkosh, is submitting this letter and the attached analytical reports as notification to the WDNR as required under Wisconsin Administrative Code (Wis. Admin. Code) Chapter NR 716.14.


As we discussed during our virtual meeting, given these initial laboratory results, the natural variability in groundwater sampling, and the low levels of quantification involved, Oshkosh is electing to conduct a resampling of the monitoring wells on both the Waukau Lot and West Plant sites to confirm the initial results and improve confidence in the findings on which further decisions can be made. We plan to conduct this resampling at both sites during the month of October 2021. Once the resampling laboratory results are received and reviewed, GZA and Oshkosh will provide an interpretation of the findings, our conclusions, and the proposed next steps.

We appreciate the WDNR's assistance in this matter. If you have questions regarding the information presented, please feel free to contact us at 262-754-2578.

Sincerely,

**GZA GeoEnvironmental, Inc.**

  
Kevin M. Hedinger  
Senior Hydrogeologist  
[kevin.hedinger@gza.com](mailto:kevin.hedinger@gza.com)

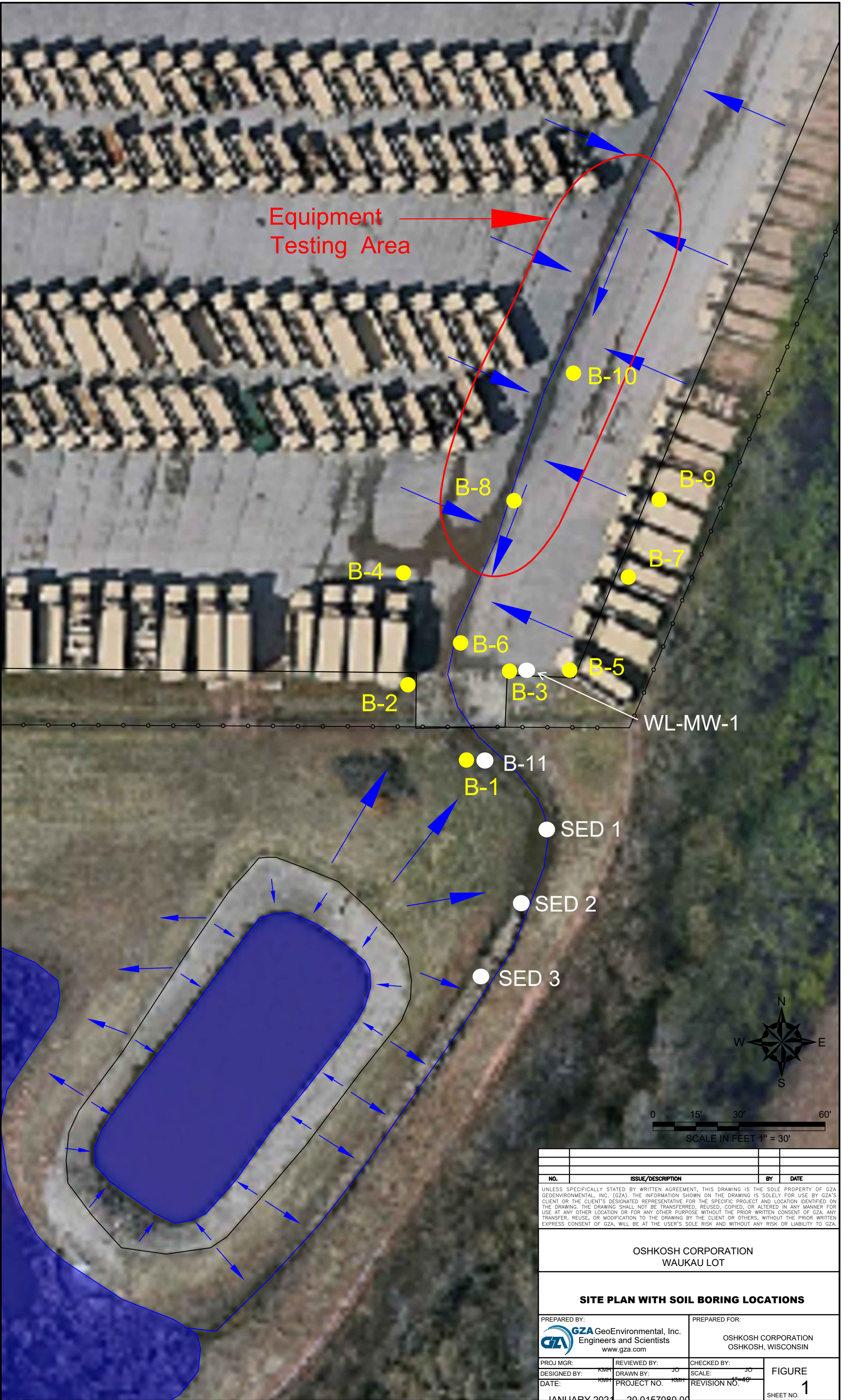
  
John C. Osborne, P.G.  
Principal Hydrogeologist  
[john.osborne@gza.com](mailto:john.osborne@gza.com)

J:\157000to157099\157080 Oshkosh\Correspondence\FINAL 20.0157080.00 Prelim Soil and GW Analytical Results\_Oshkosh WI 10-6-21.docx

Attachment: Figures 1, 2, and 3  
Laboratory Analytical Reports

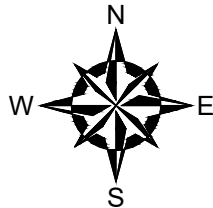
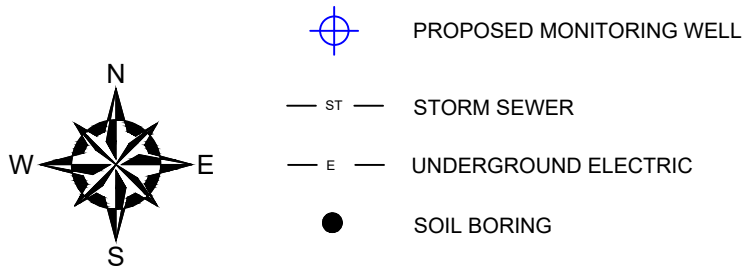
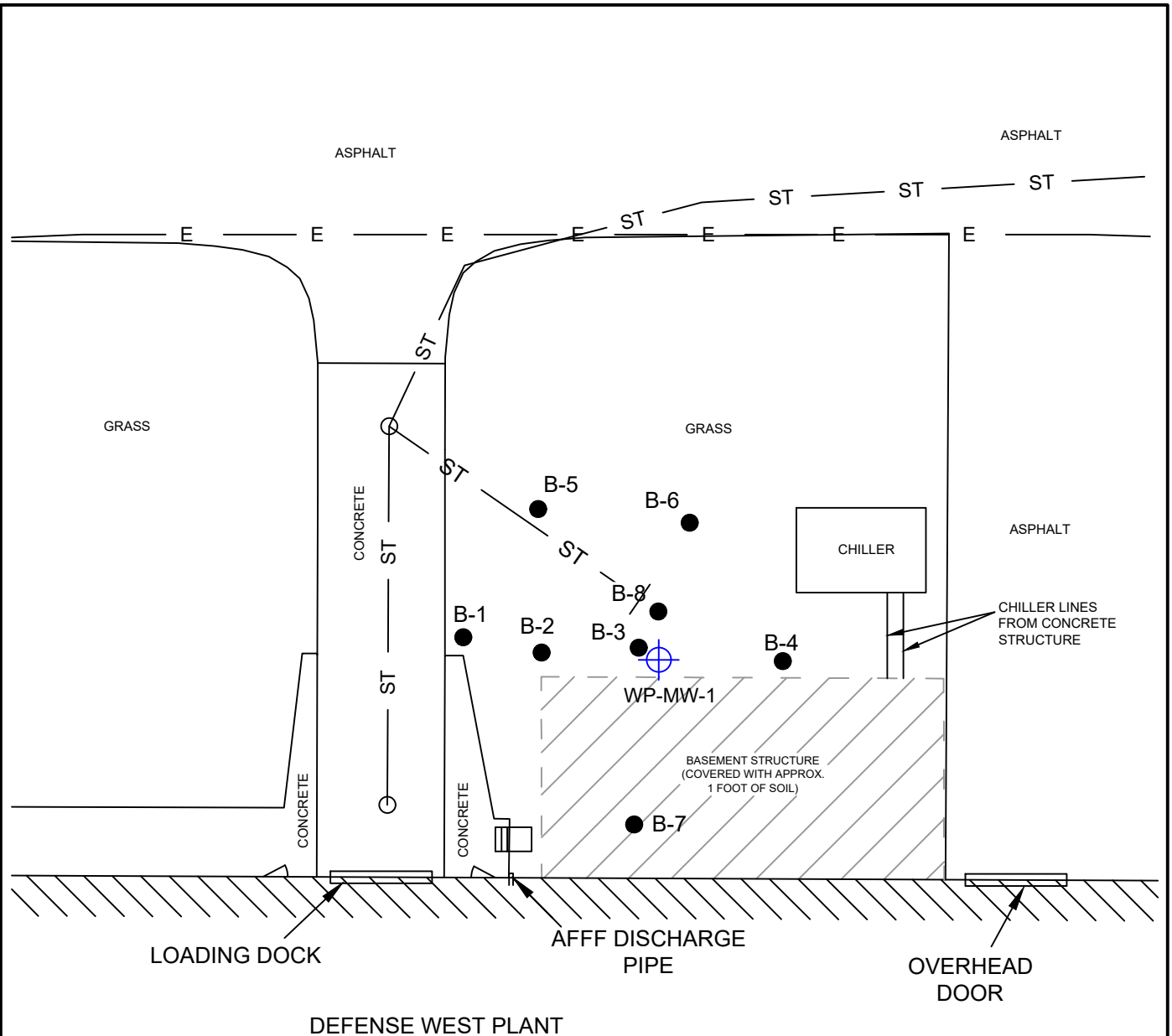
cc: Mr. Kevin Tubbs, Oshkosh Corporation  
Ms. Suzanne Murawski, Oshkosh Defense  
Mr. Michael Power, Oshkosh Defense  
Mr. Edward B. Witte, Godfrey & Kahn, S.C.

©2020 - GZA GeoEnvironmental, Inc. GZA-J:\157000T0157099\157080 OSHKOSH\REPORT\SITE INVESTIGATION REPORT-- WAUKAU LOT\FIGURES\CAD\SITE PLAN.DWG F3-- SITE PLAN JANUARY 12, 2021 KEVIN HEDINGER



NO.	ISSUE/DESCRIPTION	BY	DATE
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<b>OSHKOSH CORPORATION WAUKAU LOT</b>			
<b>SITE PLAN WITH SOIL BORING LOCATIONS</b>			
PREPARED BY: <b>GZA GeoEnvironmental, Inc.</b> Engineers and Scientists www.gza.com		PREPARED FOR: OSHKOSH CORPORATION OSHKOSH, WISCONSIN	
PROJ MGR: DESIGNED BY: DATE:	REVIEWED BY: DRAWN BY: PROJECT NO.:	CHECKED BY: SCALE: REVISION NO.:	<b>FIGURE</b> <b>1</b> SHEET NO.
JANUARY 2021 20.0157080.00			

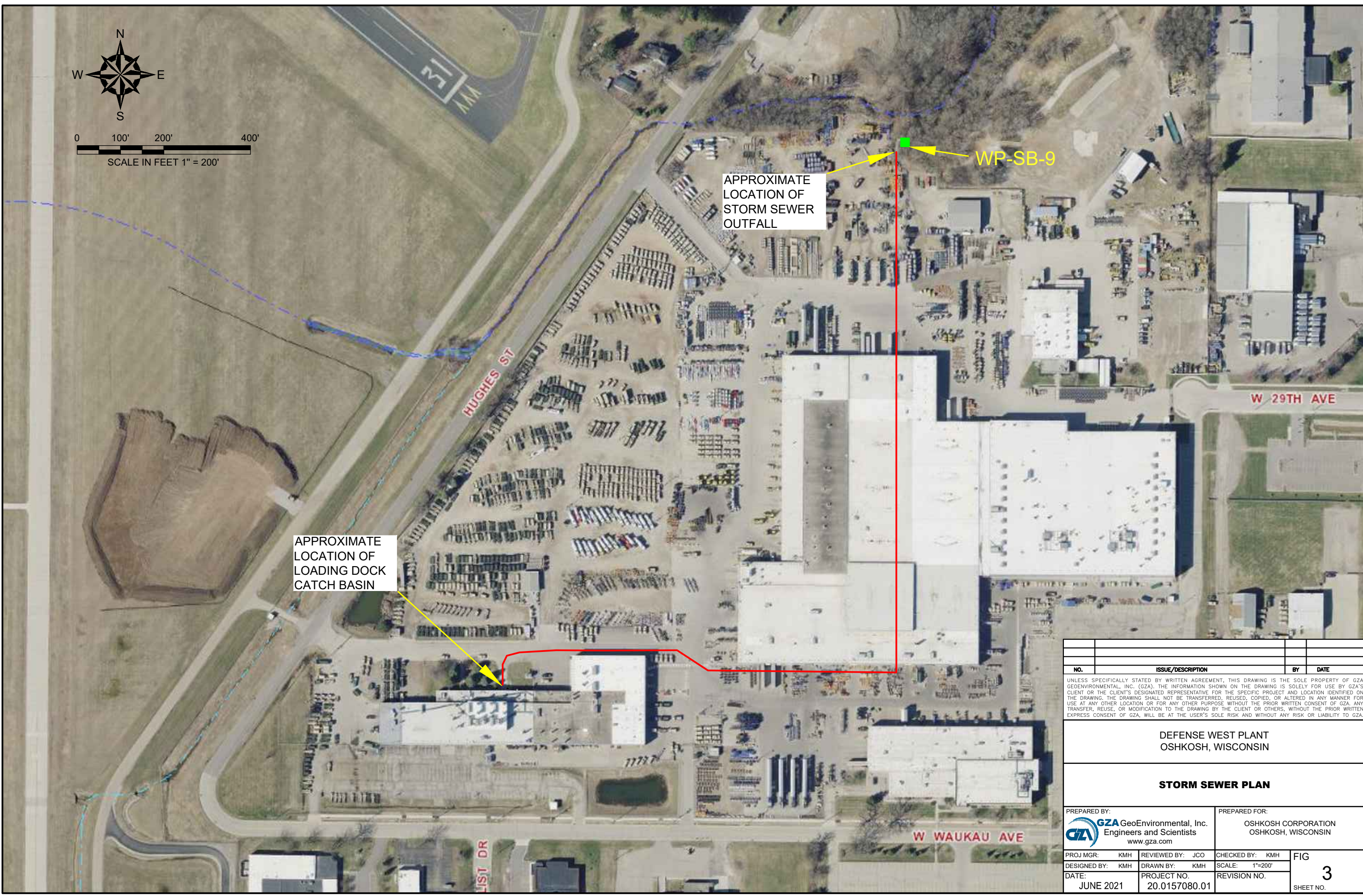
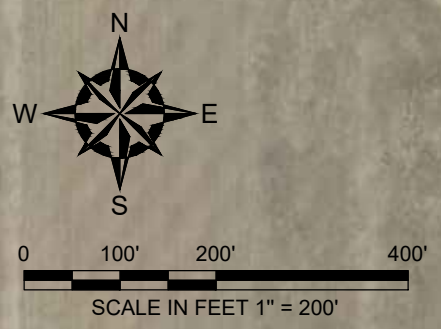
© 2020 - GZA GeoEnvironmental, Inc. GZA-J:\157000T0157099\157080 OSHKOSH\REPORT\SIWP- WEST PLANT\FIGURES\CAD\SITE PLAN.DWG F4--SOIL BORINGS JUNE 2, 2021 KEVIN HEDINGER



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<b>DEFENSE WEST PLANT OSHKOSH, WISCONSIN</b>	PREPARED BY: <b>GZA</b> GeoEnvironmental, Inc. Engineers and Scientists www.gza.com	PREPARED FOR: <b>OSHKOSH CORPORATION</b> OSHKOSH, WISCONSIN
<b>SOIL BORING PLAN &amp; PROPOSED MONITORING WELL LOCATION</b>	PROJ MGR: KMH    REVIEWED BY: JO    CHECKED BY: JO DESIGNED BY: KMH    DRAWN BY: KMH    SCALE: 1"=20' DATE: JANUARY 2021    PROJECT NO. 20.0157080.00    REVISION NO.	<b>FIGURE 2 SHEET NO.</b>

©2021 - GZA GeoEnvironmental, Inc. GZA-J:\157000TO157099\157080 OSHKOSH\REPORT\SIWP- WEST PLANT\FIGURES\CAD\SITE PLAN.DWG F3-STORM SEWER PLAN JUNE 2, 2021 KEVIN HEDINGER



NO.	ISSUE/DESCRIPTION	BY	DATE

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DEFENSE WEST PLANT  
OSHKOSH, WISCONSIN

**STORM SEWER PLAN**

PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com	PREPARED FOR: OSHKOSH CORPORATION OSHKOSH, WISCONSIN
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PROJ MGR: KMH	REVIEWED BY: JCO	CHECKED BY: KMH	FIG <b>3</b>
DESIGNED BY: KMH	DRAWN BY: KMH	SCALE: 1"=200'	
DATE: JUNE 2021	PROJECT NO. 20.0157080.01	REVISION NO.	SHEET NO.



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## Report of Analysis

**GZA GeoEnvironmental, Inc.**  
17975 West Sarah Lane, Suite 100  
Brookfield, WI 53045  
Attention: Kevin Hedinger

Project Name: 20.0157080 Oshkosh PFAS Sampling

Project Number: 20.0157080

Lot Number: **WH17016**

Date Completed: 09/16/2021

*Karen Coonan*

09/16/2021 11:08 AM

Approved and released by:  
Project Manager II: **Karen L. Coonan**



The electronic signature above is the equivalent of a handwritten signature.  
This report shall not be reproduced, except in its entirety, without the written approval of Pace Analytical Services, LLC.

# PACE ANALYTICAL SERVICES, LLC

SC DHEC No: 32010001

NELAC No: E87653

NC DENR No: 329

NC Field Parameters No: 5639

## **Case Narrative GZA GeoEnvironmental, Inc. Lot Number: WH17016**

This Report of Analysis contains the analytical result(s) for the sample(s) listed on the Sample Summary following this Case Narrative. The sample receiving date is documented in the header information associated with each sample.

All results listed in this report relate only to the samples that are contained within this report.

Sample receipt, sample analysis, and data review have been performed in accordance with the most current approved The NELAC Institute (TNI) standards, the Pace Analytical Services, LLC ("Pace") Laboratory Quality Manual, standard operating procedures (SOPs), and Pace policies. Any exceptions to the TNI standards, the Laboratory Quality Manual, SOPs or policies are qualified on the results page or discussed below.

Where applicable, all soil sample results (including LOQ and DL if requested) are corrected for dry weight unless flagged with a "W" qualifier.

If you have any questions regarding this report please contact the Pace Project Manager listed on the cover page.

# PACE ANALYTICAL SERVICES, LLC

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## Sample Summary GZA GeoEnvironmental, Inc.

Lot Number: WH17016

Project Name: 20.0157080 Oshkosh PFAS Sampling

Project Number: 20.0157080

---

Sample Number	Sample ID	Matrix	Date Sampled	Date Received
001	WL-B11 (5-6')	Solid	08/14/2021 0910	08/17/2021
002	WL-SED 1 (0-0.5')	Solid	08/14/2021 1000	08/17/2021
003	WL-SED 2 (0-0.5')	Solid	08/14/2021 1010	08/17/2021
004	WL-SED 3 (0-0.5')	Solid	08/14/2021 1020	08/17/2021
005	WL-EQUIPMENT BLANK 1- TROWEL	Aqueous	08/14/2021 1030	08/17/2021
006	WL-EQUIPMENT BLANK 2- DRIVE SHOE	Aqueous	08/14/2021 1100	08/17/2021

---

(6 samples)

# PACE ANALYTICAL SERVICES, LLC

## Detection Summary GZA GeoEnvironmental, Inc.

Lot Number: WH17016

Project Name: 20.0157080 Oshkosh PFAS Sampling

Project Number: 20.0157080

Sample	Sample ID	Matrix	Parameter	Method	Result	Q	Units	Page
001	WL-B11 (5-6')	Solid	6:2 FTS	PFAS by ID	4.1		ug/kg	5
001	WL-B11 (5-6')	Solid	PFHxA	PFAS by ID	0.28	J	ug/kg	5
001	WL-B11 (5-6')	Solid	PFPeA	PFAS by ID	0.46	J	ug/kg	5
002	WL-SED 1 (0-0.5')	Solid	6:2 FTS	PFAS by ID	41		ug/kg	6
002	WL-SED 1 (0-0.5')	Solid	PFHxA	PFAS by ID	2.7		ug/kg	6
002	WL-SED 1 (0-0.5')	Solid	PFPeA	PFAS by ID	2.9		ug/kg	6
002	WL-SED 1 (0-0.5')	Solid	PFOS	PFAS by ID	3.9		ug/kg	6
003	WL-SED 2 (0-0.5')	Solid	6:2 FTS	PFAS by ID	9.3		ug/kg	7
003	WL-SED 2 (0-0.5')	Solid	PFHxA	PFAS by ID	4.6		ug/kg	7
003	WL-SED 2 (0-0.5')	Solid	PFPeA	PFAS by ID	17		ug/kg	7
003	WL-SED 2 (0-0.5')	Solid	PFOS	PFAS by ID	5.1		ug/kg	7
004	WL-SED 3 (0-0.5')	Solid	6:2 FTS	PFAS by ID	5.1		ug/kg	8
004	WL-SED 3 (0-0.5')	Solid	PFHxA	PFAS by ID	4.3		ug/kg	8
004	WL-SED 3 (0-0.5')	Solid	PFPeA	PFAS by ID	15		ug/kg	8
004	WL-SED 3 (0-0.5')	Solid	PFOS	PFAS by ID	2.8		ug/kg	8

(15 detections)



# PFAS by LC/MS/MS

Client: <b>GZA GeoEnvironmental, Inc.</b>	Laboratory ID: <b>WH17016-001</b>
Description: <b>WL-B11 (5-6')</b>	Matrix: <b>Solid</b>
Date Sampled: <b>08/14/2021 0910</b>	Project Name: <b>20.0157080 Oshkosh PFAS</b>
Date Received: <b>08/17/2021</b>	% Solids: <b>80.5 08/17/2021 2133</b>
Project Number: <b>20.0157080</b>	

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	SOP SPE	PFAS by ID SOP	1	08/28/2021 0010	NK1	08/26/2021 1150	13393

Parameter	CAS Number	Analytical Method	Result	Q	LOQ	MDL	Units	Run
1H, 1H, 2H, 2H-perfluorooctane sulfonic acid (6:2 FTS)	27619-97-2	PFAS by ID SOP	4.1		2.3	0.35	ug/kg	1
Perfluoro-n-hexanoic acid (PFHxA)	307-24-4	PFAS by ID SOP	0.28	J	1.1	0.21	ug/kg	1
Perfluoro-n-octanoic acid (PFOA)	335-67-1	PFAS by ID SOP	ND		1.1	0.24	ug/kg	1
Perfluoro-n-pentanoic acid (PFPeA)	2706-90-3	PFAS by ID SOP	0.46	J	1.1	0.18	ug/kg	1
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	PFAS by ID SOP	ND		1.1	0.41	ug/kg	1

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C2_6:2FTS		83	25-150
13C5_PFHxA		86	25-150
13C5_PFPeA		87	25-150
13C8_PFOA		84	25-150
13C8_PFOS		84	25-150

LOQ = Limit of Quantitation      B = Detected in the method blank      E = Quantitation of compound exceeded the calibration range      DL = Detection Limit      Q = Surrogate failure  
 ND = Not detected at or above the DL      N = Recovery is out of criteria      P = The RPD between two GC columns exceeds 40%      J = Estimated result < LOQ and ≥ DL      L = LCS/LCSD failure  
 H = Out of holding time      W = Reported on wet weight basis      S = MS/MSD failure

Pace Analytical Services, LLC (formerly Shealy Environmental Services, Inc.)  
 106 Vantage Point Drive West Columbia, SC 29172 (803) 791-9700 Fax (803) 791-9111 www.pacelabs.com

# PFAS by LC/MS/MS

Client: <b>GZA GeoEnvironmental, Inc.</b>	Laboratory ID: <b>WH17016-002</b>
Description: <b>WL-SED 1 (0-0.5')</b>	Matrix: <b>Solid</b>
Date Sampled: <b>08/14/2021 1000</b>	Project Name: <b>20.0157080 Oshkosh PFAS</b>
Date Received: <b>08/17/2021</b>	% Solids: <b>61.4 08/17/2021 2133</b>
Project Number: <b>20.0157080</b>	

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	SOP SPE	PFAS by ID SOP	1	08/28/2021 0020	NK1	08/26/2021 1150	13393

Parameter	CAS Number	Analytical Method	Result	Q	LOQ	MDL	Units	Run
1H, 1H, 2H, 2H-perfluorooctane sulfonic acid (6:2 FTS)	27619-97-2	PFAS by ID SOP	41		3.2	0.48	ug/kg	1
Perfluoro-n-hexanoic acid (PFHxA)	307-24-4	PFAS by ID SOP	2.7		1.6	0.29	ug/kg	1
Perfluoro-n-octanoic acid (PFOA)	335-67-1	PFAS by ID SOP	ND		1.6	0.34	ug/kg	1
Perfluoro-n-pentanoic acid (PFPeA)	2706-90-3	PFAS by ID SOP	2.9		1.6	0.25	ug/kg	1
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	PFAS by ID SOP	3.9		1.6	0.56	ug/kg	1

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C2_6:2FTS		121	25-150
13C5_PFHxA		76	25-150
13C5_PFPeA		73	25-150
13C8_PFOA		75	25-150
13C8_PFOS		63	25-150

LOQ = Limit of Quantitation      B = Detected in the method blank      E = Quantitation of compound exceeded the calibration range      DL = Detection Limit      Q = Surrogate failure  
 ND = Not detected at or above the DL      N = Recovery is out of criteria      P = The RPD between two GC columns exceeds 40%      J = Estimated result < LOQ and ≥ DL      L = LCS/LCSD failure  
 H = Out of holding time      W = Reported on wet weight basis      S = MS/MSD failure

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# PFAS by LC/MS/MS

Client: <b>GZA GeoEnvironmental, Inc.</b>	Laboratory ID: <b>WH17016-003</b>
Description: <b>WL-SED 2 (0-0.5')</b>	Matrix: <b>Solid</b>
Date Sampled: <b>08/14/2021 1010</b>	Project Name: <b>20.0157080 Oshkosh PFAS</b>
Date Received: <b>08/17/2021</b>	% Solids: <b>67.6 08/17/2021 2133</b>
Project Number: <b>20.0157080</b>	

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	SOP SPE	PFAS by ID SOP	1	08/28/2021 0031	NK1	08/26/2021 1150	13393

Parameter	CAS Number	Analytical Method	Result	Q	LOQ	MDL	Units	Run
1H, 1H, 2H, 2H-perfluorooctane sulfonic acid (6:2 FTS)	27619-97-2	PFAS by ID SOP	9.3		2.8	0.42	ug/kg	1
Perfluoro-n-hexanoic acid (PFHxA)	307-24-4	PFAS by ID SOP	4.6		1.4	0.26	ug/kg	1
Perfluoro-n-octanoic acid (PFOA)	335-67-1	PFAS by ID SOP	ND		1.4	0.29	ug/kg	1
Perfluoro-n-pentanoic acid (PFPeA)	2706-90-3	PFAS by ID SOP	17		1.4	0.22	ug/kg	1
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	PFAS by ID SOP	5.1		1.4	0.49	ug/kg	1

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C2_6:2FTS		99	25-150
13C5_PFHxA		78	25-150
13C5_PFPeA		74	25-150
13C8_PFOA		82	25-150
13C8_PFOS		71	25-150

LOQ = Limit of Quantitation      B = Detected in the method blank      E = Quantitation of compound exceeded the calibration range      DL = Detection Limit      Q = Surrogate failure  
 ND = Not detected at or above the DL      N = Recovery is out of criteria      P = The RPD between two GC columns exceeds 40%      J = Estimated result < LOQ and ≥ DL      L = LCS/LCSD failure  
 H = Out of holding time      W = Reported on wet weight basis      S = MS/MSD failure

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# PFAS by LC/MS/MS

Client: <b>GZA GeoEnvironmental, Inc.</b>	Laboratory ID: <b>WH17016-004</b>
Description: <b>WL-SED 3 (0-0.5')</b>	Matrix: <b>Solid</b>
Date Sampled: <b>08/14/2021 1020</b>	Project Name: <b>20.0157080 Oshkosh PFAS</b>
Date Received: <b>08/17/2021</b>	% Solids: <b>65.7 08/17/2021 2133</b>
Project Number: <b>20.0157080</b>	

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	SOP SPE	PFAS by ID SOP	1	08/28/2021 0041	NK1	08/26/2021 1150	13393

Parameter	CAS Number	Analytical Method	Result	Q	LOQ	MDL	Units	Run
1H, 1H, 2H, 2H-perfluorooctane sulfonic acid (6:2 FTS)	27619-97-2	PFAS by ID SOP	5.1		2.6	0.40	ug/kg	1
Perfluoro-n-hexanoic acid (PFHxA)	307-24-4	PFAS by ID SOP	4.3		1.3	0.24	ug/kg	1
Perfluoro-n-octanoic acid (PFOA)	335-67-1	PFAS by ID SOP	ND		1.3	0.28	ug/kg	1
Perfluoro-n-pentanoic acid (PFPeA)	2706-90-3	PFAS by ID SOP	15		1.3	0.21	ug/kg	1
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	PFAS by ID SOP	2.8		1.3	0.47	ug/kg	1

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C2_6:2FTS		84	25-150
13C5_PFHxA		73	25-150
13C5_PFPeA		68	25-150
13C8_PFOA		72	25-150
13C8_PFOS		64	25-150

LOQ = Limit of Quantitation      B = Detected in the method blank      E = Quantitation of compound exceeded the calibration range      DL = Detection Limit      Q = Surrogate failure  
 ND = Not detected at or above the DL      N = Recovery is out of criteria      P = The RPD between two GC columns exceeds 40%      J = Estimated result < LOQ and ≥ DL      L = LCS/LCSD failure  
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# PFAS by LC/MS/MS

Client: <b>GZA GeoEnvironmental, Inc.</b>	Laboratory ID: <b>WH17016-005</b>
Description: <b>WL-EQUIPMENT BLANK 1- TROWEL</b>	Matrix: <b>Aqueous</b>
Date Sampled: <b>08/14/2021 1030</b>	Project Name: <b>20.0157080 Oshkosh PFAS</b>
Date Received: <b>08/17/2021</b>	Project Number: <b>20.0157080</b>

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	SOP SPE	PFAS by ID SOP	1	09/09/2021 1804	SES	09/08/2021 1730	14782

Parameter	CAS Number	Analytical Method	Result	Q	LOQ	MDL	Units	Run
1H, 1H, 2H, 2H-perfluorooctane sulfonic acid (6:2 FTS)	27619-97-2	PFAS by ID SOP	ND		8.3	2.1	ng/L	1
Perfluoro-n-hexanoic acid (PFHxA)	307-24-4	PFAS by ID SOP	ND		4.2	0.72	ng/L	1
Perfluoro-n-octanoic acid (PFOA)	335-67-1	PFAS by ID SOP	ND		4.2	0.86	ng/L	1
Perfluoro-n-pentanoic acid (PFPeA)	2706-90-3	PFAS by ID SOP	ND		4.2	0.57	ng/L	1
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	PFAS by ID SOP	ND		4.2	2.1	ng/L	1

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C2_6:2FTS		118	25-150
13C5_PFHxA		92	25-150
13C5_PFPeA		98	25-150
13C8_PFOA		90	25-150
13C8_PFOS		89	25-150

LOQ = Limit of Quantitation      B = Detected in the method blank      E = Quantitation of compound exceeded the calibration range      DL = Detection Limit      Q = Surrogate failure  
 ND = Not detected at or above the DL      N = Recovery is out of criteria      P = The RPD between two GC columns exceeds 40%      J = Estimated result < LOQ and ≥ DL      L = LCS/LCSD failure  
 H = Out of holding time      W = Reported on wet weight basis      S = MS/MSD failure

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 106 Vantage Point Drive West Columbia, SC 29172 (803) 791-9700 Fax (803) 791-9111 www.pacelabs.com

# PFAS by LC/MS/MS

Client: <b>GZA GeoEnvironmental, Inc.</b>	Laboratory ID: <b>WH17016-006</b>
Description: <b>WL-EQUIPMENT BLANK 2- DRIVE SHOE</b>	Matrix: <b>Aqueous</b>
Date Sampled: <b>08/14/2021 1100</b>	Project Name: <b>20.0157080 Oshkosh PFAS</b>
Date Received: <b>08/17/2021</b>	Project Number: <b>20.0157080</b>

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	SOP SPE	PFAS by ID SOP	1	09/09/2021 1815	SES	09/08/2021 1730	14782

Parameter	CAS Number	Analytical Method	Result	Q	LOQ	MDL	Units	Run
1H, 1H, 2H, 2H-perfluorooctane sulfonic acid (6:2 FTS)	27619-97-2	PFAS by ID SOP	ND		9.2	2.3	ng/L	1
Perfluoro-n-hexanoic acid (PFHxA)	307-24-4	PFAS by ID SOP	ND		4.6	0.79	ng/L	1
Perfluoro-n-octanoic acid (PFOA)	335-67-1	PFAS by ID SOP	ND		4.6	0.95	ng/L	1
Perfluoro-n-pentanoic acid (PFPeA)	2706-90-3	PFAS by ID SOP	ND		4.6	0.62	ng/L	1
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	PFAS by ID SOP	ND		4.6	2.3	ng/L	1

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C2_6:2FTS		142	25-150
13C5_PFHxA		92	25-150
13C5_PFPeA		96	25-150
13C8_PFOA		87	25-150
13C8_PFOS		93	25-150

LOQ = Limit of Quantitation      B = Detected in the method blank      E = Quantitation of compound exceeded the calibration range      DL = Detection Limit      Q = Surrogate failure  
 ND = Not detected at or above the DL      N = Recovery is out of criteria      P = The RPD between two GC columns exceeds 40%      J = Estimated result < LOQ and ≥ DL      L = LCS/LCSD failure  
 H = Out of holding time      W = Reported on wet weight basis      S = MS/MSD failure

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## QC Summary

## PFAS by LC/MS/MS - MB

Sample ID: WQ13393-001

Matrix: Solid

Batch: 13393

Prep Method: SOP SPE

Analytical Method: PFAS by ID SOP

Prep Date: 08/26/2021 1150

Parameter	Result	Q	Dil	LOQ	MDL	Units	Analysis Date
6:2 FTS	ND		1	2.0	0.31	ug/kg	08/27/2021 1438
PFHxA	ND		1	1.0	0.18	ug/kg	08/27/2021 1438
PFOA	ND		1	1.0	0.21	ug/kg	08/27/2021 1438
PFPeA	ND		1	1.0	0.16	ug/kg	08/27/2021 1438
PFOS	ND		1	1.0	0.36	ug/kg	08/27/2021 1438

Surrogate	Q	% Rec	Acceptance Limit
13C2_6:2FTS		93	25-150
13C5_PFHxA		99	25-150
13C5_PFPeA		92	25-150
13C8_PFOA		102	25-150
13C8_PFOS		91	25-150

LOQ = Limit of Quantitation

ND = Not detected at or above the DL

N = Recovery is out of criteria

DL = Detection Limit

J = Estimated result < LOQ and ≥ DL

P = The RPD between two GC columns exceeds 40%

\* = RSD is out of criteria

+ = RPD is out of criteria

**Note: Calculations are performed before rounding to avoid round-off errors in calculated results**



# PFAS by LC/MS/MS - LCS

Sample ID: WQ13393-002

Matrix: Solid

Batch: 13393

Prep Method: SOP SPE

Analytical Method: PFAS by ID SOP

Prep Date: 08/26/2021 1150

Parameter	Spike Amount (ug/kg)	Result (ug/kg)	Q	Dil	% Rec	%Rec Limit	Analysis Date
6:2 FTS	1.9	2.0		1	105	50-150	08/27/2021 1448
PFHxA	2.0	1.9		1	93	50-150	08/27/2021 1448
PFOA	2.0	1.9		1	96	50-150	08/27/2021 1448
PFPeA	2.0	1.9		1	93	50-150	08/27/2021 1448
PFOS	1.9	1.7		1	91	50-150	08/27/2021 1448

Surrogate	Q	% Rec	Acceptance Limit
13C2_6:2FTS		95	25-150
13C5_PFHxA		101	25-150
13C5_PFPeA		95	25-150
13C8_PFOA		98	25-150
13C8_PFOS		92	25-150

LOQ = Limit of Quantitation

ND = Not detected at or above the DL

N = Recovery is out of criteria

DL = Detection Limit

J = Estimated result < LOQ and ≥ DL

P = The RPD between two GC columns exceeds 40%

\* = RSD is out of criteria

+ = RPD is out of criteria

**Note: Calculations are performed before rounding to avoid round-off errors in calculated results**

## PFAS by LC/MS/MS - MB

Sample ID: WQ14782-001

Matrix: Aqueous

Batch: 14782

Prep Method: SOP SPE

Analytical Method: PFAS by ID SOP

Prep Date: 09/08/2021 1730

Parameter	Result	Q	Dil	LOQ	MDL	Units	Analysis Date
6:2 FTS	ND		1	8.0	2.0	ng/L	09/09/2021 1411
PFHxA	ND		1	4.0	0.69	ng/L	09/09/2021 1411
PFOA	ND		1	4.0	0.83	ng/L	09/09/2021 1411
PFPeA	ND		1	4.0	0.54	ng/L	09/09/2021 1411
PFOS	ND		1	4.0	2.0	ng/L	09/09/2021 1411

Surrogate	Q	% Rec	Acceptance Limit
13C2_6:2FTS		90	25-150
13C5_PFHxA		87	25-150
13C5_PFPeA		95	25-150
13C8_PFOA		79	25-150
13C8_PFOS		95	25-150

LOQ = Limit of Quantitation

ND = Not detected at or above the DL

N = Recovery is out of criteria

DL = Detection Limit

J = Estimated result < LOQ and ≥ DL

P = The RPD between two GC columns exceeds 40%

\* = RSD is out of criteria

+ = RPD is out of criteria

**Note: Calculations are performed before rounding to avoid round-off errors in calculated results**

# PFAS by LC/MS/MS - LCS

Sample ID: WQ14782-002

Matrix: Aqueous

Batch: 14782

Prep Method: SOP SPE

Analytical Method: PFAS by ID SOP

Prep Date: 09/08/2021 1730

Parameter	Spike Amount (ng/L)	Result (ng/L)	Q	Dil	% Rec	%Rec Limit	Analysis Date
6:2 FTS	15	16		1	106	50-150	09/09/2021 1422
PFHxA	16	16		1	102	50-150	09/09/2021 1422
PFOA	16	18		1	110	50-150	09/09/2021 1422
PFPeA	16	18		1	111	50-150	09/09/2021 1422
PFOS	15	16		1	107	50-150	09/09/2021 1422

Surrogate	Q	% Rec	Acceptance Limit
13C2_6:2FTS		89	25-150
13C5_PFHxA		87	25-150
13C5_PFPeA		87	25-150
13C8_PFOA		80	25-150
13C8_PFOS		78	25-150

LOQ = Limit of Quantitation

ND = Not detected at or above the DL

N = Recovery is out of criteria

DL = Detection Limit

J = Estimated result < LOQ and ≥ DL

P = The RPD between two GC columns exceeds 40%

\* = RSD is out of criteria

+ = RPD is out of criteria

**Note: Calculations are performed before rounding to avoid round-off errors in calculated results**

**Chain of Custody  
and  
Miscellaneous Documents**



# PACE ANALYTICAL SERVICES, LLC



**Samples Receipt Checklist (SRC) (ME0018C-15)**  
Issuing Authority: Pace ENV - WCOL

Revised: 9/29/2020  
Page 1 of 1

## Sample Receipt Checklist (SRC)

Client: GZA Cooler Inspected by/date: KDRW / 8/17/2021 Lot #: WH117016

Means of receipt: <input type="checkbox"/> Pace <input type="checkbox"/> Client <input type="checkbox"/> UPS <input checked="" type="checkbox"/> FedEx <input type="checkbox"/> Other:	
<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	1. Were custody seals present on the cooler?
<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> NA	2. If custody seals were present, were they intact and unbroken?
pH Strip ID: <u>NA</u> Chlorine Strip ID: <u>NA</u> Tested by: <u>NA</u>	
Original temperature upon receipt / Derived (Corrected) temperature upon receipt %Solid Snap-Cup ID: <u>21-1425</u>	
4.7 / 4.7 °C <u>NA</u> / <u>NA</u> °C <u>NA</u> / <u>NA</u> °C <u>NA</u> / <u>NA</u> °C	
Method: <input type="checkbox"/> Temperature Blank <input checked="" type="checkbox"/> Against Bottles IR Gun ID: <u>5</u> IR Gun Correction Factor: <u>0</u> °C	
Method of coolant: <input checked="" type="checkbox"/> Wet Ice <input type="checkbox"/> Ice Packs <input type="checkbox"/> Dry Ice <input type="checkbox"/> None	
<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> NA	3. If temperature of any cooler exceeded 6.0°C, was Project Manager Notified? PM was Notified by: phone / email / face-to-face (circle one).
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA	4. Is the commercial courier's packing slip attached to this form?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	5. Were proper custody procedures (relinquished/received) followed?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	6. Were sample IDs listed on the COC?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	7. Were sample IDs listed on all sample containers?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	8. Was collection date & time listed on the COC?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	9. Was collection date & time listed on all sample containers?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	10. Did all container label information (ID, date, time) agree with the COC?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	11. Were tests to be performed listed on the COC?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	12. Did all samples arrive in the proper containers for each test and/or in good condition (unbroken, lids on, etc.)?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	13. Was adequate sample volume available?
<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	14. Were all samples received within ½ the holding time or 48 hours, whichever comes first?
<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	15. Were any samples containers missing/excess (circle one) samples Not listed on COC?
<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> NA	16. For VOA and RSK-175 samples, were bubbles present >"pca-size" (¼" or 6mm in diameter) in any of the VOA vials?
<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> NA	17. Were all DRO/metals/nutrient samples received at a pH of < 2?
<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> NA	18. Were all cyanide samples received at a pH > 12 and sulfide samples received at a pH > 9?
<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> NA	19. Were all applicable NH <sub>3</sub> /TKN/cyanide/phenol/625.1/608.3 (< 0.5mg/L) samples free of residual chlorine?
<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> NA	20. Were client remarks/requests (i.e. requested dilutions, MS/MSD designations, etc...) correctly transcribed from the COC into the comment section in LIMS?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	21. Was the quote number listed on the container label? If yes, Quote # <u>25164</u>
<b>Sample Preservation (Must be completed for any sample(s) incorrectly preserved or with headspace.)</b>	
Sample(s) <u>NA</u> were received incorrectly preserved and were adjusted accordingly in sample receiving with <u>NA</u> mL of circle one: H2SO4, HNO3, HCl, NaOH using SR # <u>NA</u>	
Time of preservation <u>NA</u> . If more than one preservative is needed, please note in the comments below.	
Sample(s) <u>NA</u> were received with bubbles >6 mm in diameter.	
Samples(s) <u>NA</u> were received with TRC > 0.5 mg/L (If #19 is <i>no</i> ) and were adjusted accordingly in sample receiving with sodium thiosulfate (Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> ) with Shealy ID: <u>NA</u>	
SR barcode labels applied by: <u>JSM</u> Date: <u>8/17/2021</u>	
Comments:	



---

## Report of Analysis

**GZA GeoEnvironmental, Inc.**  
17975 West Sarah Lane, Suite 100  
Brookfield, WI 53045  
Attention: Kevin Hedinger

Project Name: Oshkosh GW PFAS Sampling

Project Number: 20.0157080

Lot Number: **WH24025**

Date Completed: 09/17/2021

*Karen Coonan*

09/17/2021 3:06 PM

Approved and released by:  
Project Manager II: **Karen L. Coonan**



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Pace Analytical Services, LLC (formerly Shealy Environmental Services, Inc.)  
106 Vantage Point Drive West Columbia, SC 29172  
Tel: 803-791-9700 Fax: 803-791-9111 www.pacelabs.com

# PACE ANALYTICAL SERVICES, LLC

SC DHEC No: 32010001

NELAC No: E87653

NC DENR No: 329

NC Field Parameters No: 5639

**Case Narrative**  
**GZA GeoEnvironmental, Inc.**  
**Lot Number: WH24025**

This Report of Analysis contains the analytical result(s) for the sample(s) listed on the Sample Summary following this Case Narrative. The sample receiving date is documented in the header information associated with each sample.

All results listed in this report relate only to the samples that are contained within this report.

Sample receipt, sample analysis, and data review have been performed in accordance with the most current approved The NELAC Institute (TNI) standards, the Pace Analytical Services, LLC ("Pace") Laboratory Quality Manual, standard operating procedures (SOPs), and Pace policies. Any exceptions to the TNI standards, the Laboratory Quality Manual, SOPs or policies are qualified on the results page or discussed below.

If you have any questions regarding this report please contact the Pace Project Manager listed on the cover page.



# PACE ANALYTICAL SERVICES, LLC

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Sample Summary  
GZA GeoEnvironmental, Inc.  
Lot Number: WH24025  
Project Name: Oshkosh GW PFAS Sampling  
Project Number: 20.0157080

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Sample Number	Sample ID	Matrix	Date Sampled	Date Received
001	WL-MW-1	Aqueous	08/19/2021 1655	08/24/2021

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(1 sample)

# PACE ANALYTICAL SERVICES, LLC

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Detection Summary  
GZA GeoEnvironmental, Inc.  
Lot Number: WH24025  
Project Name: Oshkosh GW PFAS Sampling  
Project Number: 20.0157080

Sample	Sample ID	Matrix	Parameter	Method	Result	Q	Units	Page
001	WL-MW-1	Aqueous	6:2 FTS	PFAS by ID	10000		ng/L	5
001	WL-MW-1	Aqueous	PFHxS	PFAS by ID	34	J	ng/L	5
001	WL-MW-1	Aqueous	PFBA	PFAS by ID	460		ng/L	5
001	WL-MW-1	Aqueous	PFHpA	PFAS by ID	320		ng/L	5
001	WL-MW-1	Aqueous	PFHxA	PFAS by ID	1600		ng/L	5
001	WL-MW-1	Aqueous	PFOA	PFAS by ID	41	J	ng/L	6
001	WL-MW-1	Aqueous	PFPeA	PFAS by ID	3200		ng/L	6

(7 detections)

# PFAS by LC/MS/MS

Client: GZA GeoEnvironmental, Inc.	Laboratory ID: WH24025-001
Description: WL-MW-1	Matrix: Aqueous
Date Sampled: 08/19/2021 1655	Project Name: Oshkosh GW PFAS Sampling
Date Received: 08/24/2021	Project Number: 20.0157080

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	SOP SPE	PFAS by ID SOP	20	09/15/2021 1832	MMM	09/13/2021 1227	15147

Parameter	CAS Number	Analytical Method	Result	Q	LOQ	MDL	Units	Run
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	756426-58-1	PFAS by ID SOP	ND		150	9.2	ng/L	1
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3...)	763051-92-9	PFAS by ID SOP	ND		150	13	ng/L	1
1H, 1H, 2H, 2H-perfluorodecane sulfonic acid (8:2 FTS)	39108-34-4	PFAS by ID SOP	ND		150	30	ng/L	1
1H, 1H, 2H, 2H-perfluorooctane sulfonic acid (6:2 FTS)	27619-97-2	PFAS by ID SOP	10000		150	38	ng/L	1
1H,1H,2H,2H-perfluorohexane sulfonic acid (4:2 FTS)	757124-72-4	PFAS by ID SOP	ND		150	17	ng/L	1
Hexafluoropropylene oxide dimer acid (GenX)	13252-13-6	PFAS by ID SOP	ND		150	39	ng/L	1
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	919005-14-4	PFAS by ID SOP	ND		150	9.2	ng/L	1
N-ethylperfluoro-1-octanesulfonamide (EtFOSA)	4151-50-2	PFAS by ID SOP	ND		150	26	ng/L	1
N-ethylperfluoro-1-octanesulfonamidoacetic acid (EtFOSAA)	2991-50-6	PFAS by ID SOP	ND		150	14	ng/L	1
2-N-ethylperfluoro-1-octanesulfonamido-ethanol (EtFOSE)	1691-99-2	PFAS by ID SOP	ND		150	18	ng/L	1
N-methylperfluoro-1-octanesulfonamide (MeFOSA)	31506-32-8	PFAS by ID SOP	ND		300	24	ng/L	1
N-methylperfluoro-1-octanesulfonamidoacetic acid (MeFOSAA)	2355-31-9	PFAS by ID SOP	ND		150	18	ng/L	1
2-N-methylperfluoro-1-octanesulfonamido-ethanol (MeFOSE)	24448-09-7	PFAS by ID SOP	ND		150	24	ng/L	1
Perfluoro-1-butanefluoronic acid (PFBS)	375-73-5	PFAS by ID SOP	ND		76	7.9	ng/L	1
Perfluoro-1-decanesulfonic acid (PFDS)	335-77-3	PFAS by ID SOP	ND		76	15	ng/L	1
Perfluoro-1-heptanesulfonic acid (PFHpS)	375-92-8	PFAS by ID SOP	ND		76	9.5	ng/L	1
Perfluoro-1-nonanesulfonic acid (PFNS)	68259-12-1	PFAS by ID SOP	ND		76	14	ng/L	1
Perfluoro-1-octanesulfonamide (PFOSA)	754-91-6	PFAS by ID SOP	ND		76	12	ng/L	1
Perfluoro-1-pentanesulfonic acid (PFPeS)	2706-91-4	PFAS by ID SOP	ND		76	11	ng/L	1
Perfluorododecanesulfonic acid (PFDOS)	79780-39-5	PFAS by ID SOP	ND		150	20	ng/L	1
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	PFAS by ID SOP	34	J	76	10	ng/L	1
Perfluoro-n-butyric acid (PFBA)	375-22-4	PFAS by ID SOP	460		76	11	ng/L	1
Perfluoro-n-decanoic acid (PFDA)	335-76-2	PFAS by ID SOP	ND		76	10	ng/L	1
Perfluoro-n-dodecanoic acid (PFDoA)	307-55-1	PFAS by ID SOP	ND		76	9.0	ng/L	1
Perfluoro-n-heptanoic acid (PFHpA)	375-85-9	PFAS by ID SOP	320		76	8.5	ng/L	1
Perfluoro-n-hexanoic acid (PFHxA)	307-24-4	PFAS by ID SOP	1600		76	13	ng/L	1
Perfluoro-n-nonanoic acid (PFNA)	375-95-1	PFAS by ID SOP	ND		76	8.8	ng/L	1
Perfluoro-n-octanoic acid (PFOA)	335-67-1	PFAS by ID SOP	41	J	76	16	ng/L	1
Perfluoro-n-pentanoic acid (PFPeA)	2706-90-3	PFAS by ID SOP	3200		76	10	ng/L	1
Perfluoro-n-tetradecanoic acid (PFTeDA)	376-06-7	PFAS by ID SOP	ND		76	11	ng/L	1
Perfluoro-n-tridecanoic acid (PFTrDA)	72629-94-8	PFAS by ID SOP	ND		76	10	ng/L	1
Perfluoro-n-undecanoic acid (PFUDA)	2058-94-8	PFAS by ID SOP	ND		76	12	ng/L	1
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	PFAS by ID SOP	ND		76	38	ng/L	1

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C2_4:2FTS		132	25-150
13C2_6:2FTS		130	25-150
13C2_8:2FTS		120	25-150
13C2_PFDa		102	25-150
13C2_PFTeDA		97	25-150
13C3_PFBS		99	25-150
13C3_PFHxS		87	25-150
13C3-HFPO-DA		95	25-150
13C4_PFBA		98	25-150

LOQ = Limit of Quantitation      B = Detected in the method blank      E = Quantitation of compound exceeded the calibration range      DL = Detection Limit      Q = Surrogate failure  
 ND = Not detected at or above the DL      N = Recovery is out of criteria      P = The RPD between two GC columns exceeds 40%      J = Estimated result < LOQ and ≥ DL      L = LCS/LCSD failure  
 H = Out of holding time      W = Reported on wet weight basis      S = MS/MSD failure

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# PFAS by LC/MS/MS

Client: GZA GeoEnvironmental, Inc.	Laboratory ID: WH24025-001
Description: WL-MW-1	Matrix: Aqueous
Date Sampled: 08/19/2021 1655	Project Name: Oshkosh GW PFAS Sampling
Date Received: 08/24/2021	Project Number: 20.0157080

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C4_PFHpA		110	25-150
13C5_PFHxA		94	25-150
13C5_PFPeA		99	25-150
13C6_PFDA		92	25-150
13C7_PFUdA		90	25-150
13C8_PFOA		97	25-150
13C8_PFOS		72	25-150
13C8_PFOSA		82	10-150
13C9_PFNA		95	25-150
d-EtFOSA		94	10-150
d5-EtFOSAA		106	25-150
d9-EtFOSE		90	10-150
d-MeFOSA		85	10-150
d3-MeFOSAA		104	25-150
d7-MeFOSE		90	10-150

---

LOQ = Limit of Quantitation      B = Detected in the method blank      E = Quantitation of compound exceeded the calibration range      DL = Detection Limit      Q = Surrogate failure  
 ND = Not detected at or above the DL      N = Recovery is out of criteria      P = The RPD between two GC columns exceeds 40%      J = Estimated result < LOQ and ≥ DL      L = LCS/LCSD failure  
 H = Out of holding time      W = Reported on wet weight basis      S = MS/MSD failure

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## QC Summary

PFAS by LC/MS/MS - MB

Sample ID: WQ15147-001

Matrix: Aqueous

Batch: 15147

Prep Method: SOP SPE

Analytical Method: PFAS by ID SOP

Prep Date: 09/13/2021 1227

Parameter	Result	Q	Dil	LOQ	MDL	Units	Analysis Date
9CI-PF3ONS	ND		1	8.0	0.48	ng/L	09/14/2021 1800
11CI-PF3OUdS	ND		1	8.0	0.66	ng/L	09/14/2021 1800
8:2 FTS	ND		1	8.0	1.6	ng/L	09/14/2021 1800
6:2 FTS	ND		1	8.0	2.0	ng/L	09/14/2021 1800
4:2 FTS	ND		1	8.0	0.87	ng/L	09/14/2021 1800
GenX	ND		1	8.0	2.1	ng/L	09/14/2021 1800
ADONA	ND		1	8.0	0.48	ng/L	09/14/2021 1800
EtFOSA	ND		1	8.0	1.4	ng/L	09/14/2021 1800
EtFOSAA	ND		1	8.0	0.75	ng/L	09/14/2021 1800
EtFOSE	ND		1	8.0	0.95	ng/L	09/14/2021 1800
MeFOSA	ND		1	16	1.3	ng/L	09/14/2021 1800
MeFOSAA	ND		1	8.0	0.93	ng/L	09/14/2021 1800
MeFOSE	ND		1	8.0	1.3	ng/L	09/14/2021 1800
PFBS	ND		1	4.0	0.41	ng/L	09/14/2021 1800
PFDS	ND		1	4.0	0.78	ng/L	09/14/2021 1800
PFHpS	ND		1	4.0	0.50	ng/L	09/14/2021 1800
PFNS	ND		1	4.0	0.71	ng/L	09/14/2021 1800
PFOSA	ND		1	4.0	0.61	ng/L	09/14/2021 1800
PFPeS	ND		1	4.0	0.59	ng/L	09/14/2021 1800
PFDOS	ND		1	8.0	1.0	ng/L	09/14/2021 1800
PFHxS	ND		1	4.0	0.55	ng/L	09/14/2021 1800
PFBA	ND		1	4.0	0.60	ng/L	09/14/2021 1800
PFDA	ND		1	4.0	0.52	ng/L	09/14/2021 1800
PFDoA	ND		1	4.0	0.47	ng/L	09/14/2021 1800
PFHpA	ND		1	4.0	0.45	ng/L	09/14/2021 1800
PFHxA	ND		1	4.0	0.69	ng/L	09/14/2021 1800
PFNA	ND		1	4.0	0.46	ng/L	09/14/2021 1800
PFOA	ND		1	4.0	0.83	ng/L	09/14/2021 1800
PFPeA	ND		1	4.0	0.54	ng/L	09/14/2021 1800
PFTeDA	ND		1	4.0	0.60	ng/L	09/14/2021 1800
PFTTrDA	ND		1	4.0	0.53	ng/L	09/14/2021 1800
PFUdA	ND		1	4.0	0.63	ng/L	09/14/2021 1800
PFOS	ND		1	4.0	2.0	ng/L	09/14/2021 1800

Surrogate	Q	% Rec	Acceptance Limit
13C2_4:2FTS		143	25-150
13C2_6:2FTS		92	25-150
13C2_8:2FTS		100	25-150
13C2_PFDoA		115	25-150
13C2_PFTeDA		126	25-150
13C3_PFBs		114	25-150
13C3_PFHxS		104	25-150
13C3-HFPO-DA		125	25-150

LOQ = Limit of Quantitation

ND = Not detected at or above the DL

N = Recovery is out of criteria

DL = Detection Limit

J = Estimated result < LOQ and ≥ DL

P = The RPD between two GC columns exceeds 40%

\* = RSD is out of criteria

+ = RPD is out of criteria

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

PFAS by LC/MS/MS - MB

Sample ID: WQ15147-001

Matrix: Aqueous

Batch: 15147

Prep Method: SOP SPE

Analytical Method: PFAS by ID SOP

Prep Date: 09/13/2021 1227

Surrogate	Q	% Rec	Acceptance Limit
13C4_PFBA		111	25-150
13C4_PFHpA		121	25-150
13C5_PFHxA		123	25-150
13C5_PFPeA		109	25-150
13C6_PFDA		115	25-150
13C7_PFUdA		118	25-150
13C8_PFOA		119	25-150
13C8_PFOS		128	25-150
13C8_PFOSA		105	10-150
13C9_PFNA		124	25-150
d-EtFOSA		104	10-150
d5-EtFOSAA		105	25-150
d9-EtFOSE		108	10-150
d-MeFOSA		107	10-150
d3-MeFOSAA		110	25-150
d7-MeFOSE		115	10-150

LOQ = Limit of Quantitation

ND = Not detected at or above the DL

N = Recovery is out of criteria

DL = Detection Limit

J = Estimated result < LOQ and  $\geq$  DL

P = The RPD between two GC columns exceeds 40%

\* = RSD is out of criteria

+ = RPD is out of criteria

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

PFAS by LC/MS/MS - LCS

Sample ID: WQ15147-002

Matrix: Aqueous

Batch: 15147

Prep Method: SOP SPE

Analytical Method: PFAS by ID SOP

Prep Date: 09/13/2021 1227

Parameter	Spike Amount (ng/L)	Result (ng/L)	Q	Dil	% Rec	%Rec Limit	Analysis Date
9CI-PF3ONS	15	13		1	88	50-150	09/14/2021 1810
11CI-PF3OUdS	15	13		1	88	50-150	09/14/2021 1810
8:2 FTS	15	13		1	83	50-150	09/14/2021 1810
6:2 FTS	15	15		1	102	50-150	09/14/2021 1810
4:2 FTS	15	15		1	100	50-150	09/14/2021 1810
GenX	32	25		1	79	50-150	09/14/2021 1810
ADONA	15	16		1	104	50-150	09/14/2021 1810
EtFOSA	16	17		1	105	50-150	09/14/2021 1810
EtFOSAA	16	16		1	103	50-150	09/14/2021 1810
EtFOSE	16	16		1	102	50-150	09/14/2021 1810
MeFOSA	16	18		1	114	50-150	09/14/2021 1810
MeFOSAA	16	16		1	97	50-150	09/14/2021 1810
MeFOSE	16	14		1	89	50-150	09/14/2021 1810
PFBS	14	15		1	103	50-150	09/14/2021 1810
PFDS	15	13		1	87	50-150	09/14/2021 1810
PFHpS	15	16		1	104	50-150	09/14/2021 1810
PFNS	15	15		1	96	50-150	09/14/2021 1810
PFOSA	16	16		1	103	50-150	09/14/2021 1810
PFPeS	15	16		1	107	50-150	09/14/2021 1810
PFDOS	15	15		1	98	50-150	09/14/2021 1810
PFHxS	15	14		1	99	50-150	09/14/2021 1810
PFBA	16	17		1	107	50-150	09/14/2021 1810
PFDA	16	16		1	99	50-150	09/14/2021 1810
PFDoA	16	18		1	112	50-150	09/14/2021 1810
PFHpA	16	17		1	106	50-150	09/14/2021 1810
PFHxA	16	15		1	95	50-150	09/14/2021 1810
PFNA	16	16		1	97	50-150	09/14/2021 1810
PFOA	16	16		1	103	50-150	09/14/2021 1810
PFPeA	16	15		1	94	50-150	09/14/2021 1810
PFTeDA	16	18		1	112	50-150	09/14/2021 1810
PFTTrDA	16	16		1	103	50-150	09/14/2021 1810
PFUdA	16	18		1	110	50-150	09/14/2021 1810
PFOS	15	15		1	101	50-150	09/14/2021 1810
Surrogate	Q	% Rec	Acceptance Limit				
13C2_4:2FTS		141	25-150				
13C2_6:2FTS		91	25-150				
13C2_8:2FTS		104	25-150				
13C2_PFDoA		102	25-150				
13C2_PFTeDA		117	25-150				
13C3_PFBS		112	25-150				
13C3_PFHxS		108	25-150				
13C3-HFPO-DA		133	25-150				

LOQ = Limit of Quantitation

ND = Not detected at or above the DL

N = Recovery is out of criteria

DL = Detection Limit

J = Estimated result < LOQ and ≥ DL

P = The RPD between two GC columns exceeds 40%

\* = RSD is out of criteria

+ = RPD is out of criteria

Note: Calculations are performed before rounding to avoid round-off errors in calculated results



PFAS by LC/MS/MS - LCS

Sample ID: WQ15147-002

Matrix: Aqueous

Batch: 15147

Prep Method: SOP SPE

Analytical Method: PFAS by ID SOP

Prep Date: 09/13/2021 1227

Surrogate	Q	% Rec	Acceptance Limit
13C4_PFBFA		112	25-150
13C4_PFHpA		107	25-150
13C5_PFHxA		117	25-150
13C5_PFPeA		125	25-150
13C6_PFDA		122	25-150
13C7_PFUdA		104	25-150
13C8_PFOA		119	25-150
13C8_PFOS		111	25-150
13C8_PFOSA		99	10-150
13C9_PFNA		128	25-150
d-EtFOSA		90	10-150
d5-EtFOSAA		112	25-150
d9-EtFOSE		108	10-150
d-MeFOSA		101	10-150
d3-MeFOSAA		107	25-150
d7-MeFOSE		113	10-150

LOQ = Limit of Quantitation

ND = Not detected at or above the DL

N = Recovery is out of criteria

DL = Detection Limit

J = Estimated result < LOQ and  $\geq$  DL

P = The RPD between two GC columns exceeds 40%

\* = RSD is out of criteria

+ = RPD is out of criteria

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

Chain of Custody  
and  
Miscellaneous Documents



**PACE ANALYTICAL SERVICES, LLC**  
 106 Vantage Point Drive • West Columbia, SC 29172  
 Telephone No. 803-791-9700 Fax No. 803-791-9111  
 www.pacelabs.com

**Number 124339**

<b>Client</b> GZA GeoEnvironmental Inc. Address 17975 W Sarah Lane Suite 100 City Brookfield State WI Zip Code 53045		<b>Report to Contact</b> Kevin Hedinger Sample's Signature <i>Elizabeth Stapleton Yu</i> Printed Name Elizabeth Stapleton Yu		<b>Telephone No. / E-mail</b> Kevin.Hedinger@gza.com Analysis (Attach list if more space is required)		<b>Quote No.</b> WH24025 KLC2 Remarks / Cooler I.D.	
<b>Project No.</b> 20.0157080 <b>Sample ID / Description</b> (Containers for each sample may be combined on one line.) WL-MW-1		<b>P.O. No.</b> 8/19/21 <b>Collection Date</b> 1655		<b>Matrix</b> Solid Liquid Gas Other		<b>No. of Containers or Preservatives Type</b> Containers H2SO4 HNO3 HCl H2O2 Other	
<b>Turn Around Time Required (Prior lab approval required for expedited IRT.)</b> <input checked="" type="checkbox"/> Standard <input type="checkbox"/> Rush (Specify)		<b>Sample Disposal</b> <input type="checkbox"/> Return to Client <input checked="" type="checkbox"/> Destroy by Lab		<b>Possible Hazard Identification</b> <input checked="" type="checkbox"/> Non-Hazard <input type="checkbox"/> Flammable <input type="checkbox"/> Skin Irritant <input type="checkbox"/> Poison <input type="checkbox"/> Unknown		<b>CC Requirements (Specify)</b> Date 8/23/21 Time 900 Date Date Time Date Date Time	
<b>1. Requisitioned by</b> <i>Elizabeth Stapleton Yu</i>		<b>1. Received by</b> FedEx		<b>1. Received by</b> Date 8/23/21 Time 900		<b>Temp Blank</b> Date 8/24/21 Time 1015 Temp Blank 57 °C	
<b>2. Requisitioned by</b> (Blank)		<b>2. Received by</b> (Blank)		<b>2. Received by</b> Date Date Time		<b>Temp Blank</b> Date Date Time	
<b>3. Requisitioned by</b> (Blank)		<b>3. Received by</b> (Blank)		<b>3. Received by</b> Date Date Time		<b>Temp Blank</b> Date Date Time	
<b>4. Requisitioned by</b> FedEx		<b>4. Laboratory received by</b> <i>Joseph Sium</i>		<b>4. Laboratory received by</b> Date 8/24/21 Time 1015		<b>Temp Blank</b> Date Date Time	

Note: All samples are retained for four weeks from receipt unless other arrangements are made.

DISTRIBUTION: WHITE & YELLOW-Return to laboratory with Sample(s), PINK-Field/Client Copy  
 Document Number: MEGA3V2-01

# PACE ANALYTICAL SERVICES, LLC



**Samples Receipt Checklist (SRC) (MED018C-15)**

Issuing Authority: Pace ENV - WCOL

Revised: 9/29/2020

Page 1 of 1

## Sample Receipt Checklist (SRC)

Client: GZA

Cooler Inspected by/date: JSM / 08/24/2021

Lot #: WH24025

Means of receipt: <input type="checkbox"/> Pace <input checked="" type="checkbox"/> Client <input type="checkbox"/> UPS <input type="checkbox"/> FedEx <input type="checkbox"/> Other:	
<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	1. Were custody seals present on the cooler?
<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> NA	2. If custody seals were present, were they intact and unbroken?
pH Strip ID: NA Chlorine Strip ID: NA Tested by: NA	
Original temperature upon receipt / Derived (Corrected) temperature upon receipt %Solid Snap-Cup ID: NA 4.2 / 4.2 °C NA / NA °C NA / NA °C NA / NA °C	
Method: <input checked="" type="checkbox"/> Temperature Blank <input type="checkbox"/> Against Bottles IR Gun ID: 5 IR Gun Correction Factor: 0 °C	
Method of coolant: <input checked="" type="checkbox"/> Wet Ice <input type="checkbox"/> Ice Packs <input type="checkbox"/> Dry Ice <input type="checkbox"/> None	
<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> NA	3. If temperature of any cooler exceeded 6.0°C, was Project Manager Notified? PM was Notified by: phone / email / face-to-face (circle one).
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA	4. Is the commercial courier's packing slip attached to this form?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	5. Were proper custody procedures (relinquished/received) followed?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	6. Were sample IDs listed on the COC?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	7. Were sample IDs listed on all sample containers?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	8. Was collection date & time listed on the COC?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	9. Was collection date & time listed on all sample containers?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	10. Did all container label information (ID, date, time) agree with the COC?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	11. Were tests to be performed listed on the COC?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	12. Did all samples arrive in the proper containers for each test and/or in good condition (unbroken, lids on, etc.)?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	13. Was adequate sample volume available?
<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	14. Were all samples received within 1/2 the holding time or 48 hours, whichever comes first?
<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	15. Were any samples containers missing/excess (circle one) samples Not listed on COC?
<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> NA	16. For VOA and RSK-175 samples, were bubbles present >"pea-size" (1/4" or 6mm in diameter) in any of the VOA vials?
<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> NA	17. Were all DRO/metals/nutrient samples received at a pH of < 2?
<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> NA	18. Were all cyanide samples received at a pH > 12 and sulfide samples received at a pH > 9?
<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> NA	19. Were all applicable NH <sub>3</sub> /TKN/cyanide/phenol/625.1/608.3 (< 0.5mg/L) samples free of residual chlorine?
<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> NA	20. Were client remarks/requests (i.e. requested dilutions, MS/MSD designations, etc...) correctly transcribed from the COC into the comment section in LIMS?
<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	21. Was the quote number listed on the container label? If yes, Quote #
<b>Sample Preservation</b> (Must be completed for any sample(s) incorrectly preserved or with headspace.)	
Sample(s) NA were received incorrectly preserved and were adjusted accordingly in sample receiving with NA mL of circle one: H2SO4, HNO3, HCl, NaOH using SR # NA	
Time of preservation NA. If more than one preservative is needed, please note in the comments below.	
Sample(s) NA were received with bubbles >6 mm in diameter.	
Sample(s) NA were received with TRC > 0.5 mg/L (If #19 is no) and were adjusted accordingly in sample receiving with sodium thiosulfate (Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> ) with Shealy ID: NA	
SR barcode labels applied by: JSM Date: 08/24/2021	
Comments:	



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## Report of Analysis

**GZA GeoEnvironmental, Inc.**  
17975 West Sarah Lane, Suite 100  
Brookfield, WI 53045  
Attention: Kevin Hedinger

Project Name: 20.0157080 Oshkosh- West Plant PFAS Sampling

Project Number: 20.0157080

Lot Number: **WH17017**

Date Completed: 09/12/2021

*Karen Coonan*

09/13/2021 10:25 AM

Approved and released by:  
Project Manager II: **Karen L. Coonan**



The electronic signature above is the equivalent of a handwritten signature.  
This report shall not be reproduced, except in its entirety, without the written approval of Pace Analytical Services, LLC.

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Pace Analytical Services, LLC (formerly Shealy Environmental Services, Inc.)  
106 Vantage Point Drive West Columbia, SC 29172  
Tel: 803-791-9700 Fax: 803-791-9111 www.pacelabs.com

# PACE ANALYTICAL SERVICES, LLC

SC DHEC No: 32010001

NELAC No: E87653

NC DENR No: 329

NC Field Parameters No: 5639

## Case Narrative GZA GeoEnvironmental, Inc. Lot Number: WH17017

This Report of Analysis contains the analytical result(s) for the sample(s) listed on the Sample Summary following this Case Narrative. The sample receiving date is documented in the header information associated with each sample.

All results listed in this report relate only to the samples that are contained within this report.

Sample receipt, sample analysis, and data review have been performed in accordance with the most current approved The NELAC Institute (TNI) standards, the Pace Analytical Services, LLC ("Pace") Laboratory Quality Manual, standard operating procedures (SOPs), and Pace policies. Any exceptions to the TNI standards, the Laboratory Quality Manual, SOPs or policies are qualified on the results page or discussed below.

Where applicable, all soil sample results (including LOQ and DL if requested) are corrected for dry weight unless flagged with a "W" qualifier.

If you have any questions regarding this report please contact the Pace Project Manager listed on the cover page.

Surrogate recovery for the following sample was outside the upper control limit: WH17017-003. This sample did not contain any target analytes; therefore, re-extraction and/or re-analysis was not performed.

# PACE ANALYTICAL SERVICES, LLC

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## Sample Summary

GZA GeoEnvironmental, Inc.

Lot Number: WH17017

Project Name: 20.0157080 Oshkosh- West Plant PFAS Sampling

Project Number: 20.0157080

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Sample Number	Sample ID	Matrix	Date Sampled	Date Received
001	WP-SB9 (1-2')	Solid	08/14/2021 1300	08/17/2021
002	WP EQUIP BLANK 1 - HAND AUGER	Aqueous	08/14/2021 1520	08/17/2021
003	WP EQUIP BLANK 2 - DRIVE SHOE	Aqueous	08/14/2021 1530	08/17/2021

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(3 samples)

# PACE ANALYTICAL SERVICES, LLC

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## Detection Summary GZA GeoEnvironmental, Inc.

Lot Number: WH17017

Project Name: 20.0157080 Oshkosh- West Plant PFAS Sampling

Project Number: 20.0157080

Sample	Sample ID	Matrix	Parameter	Method	Result	Q	Units	Page
001	WP-SB9 (1-2')	Solid	PFHpA	PFAS by ID	0.28	J	ug/kg	5
001	WP-SB9 (1-2')	Solid	PFOA	PFAS by ID	0.52	J	ug/kg	5
001	WP-SB9 (1-2')	Solid	PFPeA	PFAS by ID	0.27	J	ug/kg	5
001	WP-SB9 (1-2')	Solid	PFOS	PFAS by ID	38		ug/kg	5
002	WP EQUIP BLANK 1 - HAND AUGER	Aqueous	PFOS	PFAS by ID	2.9	J	ng/L	6

(5 detections)



# PFAS by LC/MS/MS

Client: GZA GeoEnvironmental, Inc.	Laboratory ID: WH17017-001
Description: WP-SB9 (1-2')	Matrix: Solid
Date Sampled: 08/14/2021 1300	Project Name: 20.0157080 Oshkosh- West
Date Received: 08/17/2021	% Solids: 77.1 08/17/2021 2133
Project Number: 20.0157080	

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	SOP SPE	PFAS by ID SOP	1	08/28/2021 0052	SES	08/26/2021 1150	13393

Parameter	CAS Number	Analytical Method	Result	Q	LOQ	MDL	Units	Run
1H, 1H, 2H, 2H-perfluorooctane sulfonic acid (6:2 FTS)	27619-97-2	PFAS by ID SOP	ND		2.2	0.34	ug/kg	1
Perfluoro-n-heptanoic acid (PFHpA)	375-85-9	PFAS by ID SOP	0.28	J	1.1	0.16	ug/kg	1
Perfluoro-n-hexanoic acid (PFHxA)	307-24-4	PFAS by ID SOP	ND		1.1	0.20	ug/kg	1
Perfluoro-n-octanoic acid (PFOA)	335-67-1	PFAS by ID SOP	0.52	J	1.1	0.24	ug/kg	1
Perfluoro-n-pentanoic acid (PFPeA)	2706-90-3	PFAS by ID SOP	0.27	J	1.1	0.18	ug/kg	1
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	PFAS by ID SOP	38		1.1	0.39	ug/kg	1

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C2_6:2FTS		90	25-150
13C4_PFHpA		94	25-150
13C5_PFHxA		95	25-150
13C5_PFPeA		93	25-150
13C8_PFOA		95	25-150
13C8_PFOS		80	25-150

LOQ = Limit of Quantitation      B = Detected in the method blank      E = Quantitation of compound exceeded the calibration range      DL = Detection Limit      Q = Surrogate failure  
 ND = Not detected at or above the DL      N = Recovery is out of criteria      P = The RPD between two GC columns exceeds 40%      J = Estimated result < LOQ and ≥ DL      L = LCS/LCSD failure  
 H = Out of holding time      W = Reported on wet weight basis      S = MS/MSD failure

Pace Analytical Services, LLC (formerly Shealy Environmental Services, Inc.)  
 106 Vantage Point Drive West Columbia, SC 29172 (803) 791-9700 Fax (803) 791-9111 www.pacelabs.com

# PFAS by LC/MS/MS

Client: GZA GeoEnvironmental, Inc.	Laboratory ID: WH17017-002
Description: WP EQUIP BLANK 1 - HAND AUGER	Matrix: Aqueous
Date Sampled: 08/14/2021 1520	Project Name: 20.0157080 Oshkosh- West
Date Received: 08/17/2021	Project Number: 20.0157080

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	SOP SPE	PFAS by ID SOP	1	09/09/2021 1826	SES	09/08/2021 1730	14782

Parameter	CAS Number	Analytical Method	Result	Q	LOQ	MDL	Units	Run
1H, 1H, 2H, 2H-perfluorooctane sulfonic acid (6:2 FTS)	27619-97-2	PFAS by ID SOP	ND		11	2.6	ng/L	1
Perfluoro-n-heptanoic acid (PFHpA)	375-85-9	PFAS by ID SOP	ND		5.3	0.59	ng/L	1
Perfluoro-n-hexanoic acid (PFHxA)	307-24-4	PFAS by ID SOP	ND		5.3	0.91	ng/L	1
Perfluoro-n-octanoic acid (PFOA)	335-67-1	PFAS by ID SOP	ND		5.3	1.1	ng/L	1
Perfluoro-n-pentanoic acid (PFPeA)	2706-90-3	PFAS by ID SOP	ND		5.3	0.72	ng/L	1
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	PFAS by ID SOP	2.9	J	5.3	2.6	ng/L	1

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C2_6:2FTS		124	25-150
13C4_PFHpA		95	25-150
13C5_PFHxA		89	25-150
13C5_PFPeA		87	25-150
13C8_PFOA		84	25-150
13C8_PFOS		90	25-150

LOQ = Limit of Quantitation      B = Detected in the method blank      E = Quantitation of compound exceeded the calibration range      DL = Detection Limit      Q = Surrogate failure  
 ND = Not detected at or above the DL      N = Recovery is out of criteria      P = The RPD between two GC columns exceeds 40%      J = Estimated result < LOQ and ≥ DL      L = LCS/LCSD failure  
 H = Out of holding time      W = Reported on wet weight basis      S = MS/MSD failure

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 106 Vantage Point Drive West Columbia, SC 29172 (803) 791-9700 Fax (803) 791-9111 www.pacelabs.com

# PFAS by LC/MS/MS

Client: GZA GeoEnvironmental, Inc.	Laboratory ID: WH17017-003
Description: WP EQUIP BLANK 2 - DRIVE SHOE	Matrix: Aqueous
Date Sampled: 08/14/2021 1530	Project Name: 20.0157080 Oshkosh- West
Date Received: 08/17/2021	Project Number: 20.0157080

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	SOP SPE	PFAS by ID SOP	1	09/09/2021 1836	SES	09/08/2021 1730	14782

Parameter	CAS Number	Analytical Method	Result	Q	LOQ	MDL	Units	Run
1H, 1H, 2H, 2H-perfluorooctane sulfonic acid (6:2 FTS)	27619-97-2	PFAS by ID SOP	ND	Q	10	2.5	ng/L	1
Perfluoro-n-heptanoic acid (PFHpA)	375-85-9	PFAS by ID SOP	ND		5.0	0.56	ng/L	1
Perfluoro-n-hexanoic acid (PFHxA)	307-24-4	PFAS by ID SOP	ND		5.0	0.86	ng/L	1
Perfluoro-n-octanoic acid (PFOA)	335-67-1	PFAS by ID SOP	ND		5.0	1.0	ng/L	1
Perfluoro-n-pentanoic acid (PFPeA)	2706-90-3	PFAS by ID SOP	ND		5.0	0.68	ng/L	1
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	PFAS by ID SOP	ND		5.0	2.5	ng/L	1

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C2_6:2FTS	N	244	25-150
13C4_PFHpA		90	25-150
13C5_PFHxA		90	25-150
13C5_PFPeA		93	25-150
13C8_PFOA		88	25-150
13C8_PFOS		93	25-150

LOQ = Limit of Quantitation      B = Detected in the method blank      E = Quantitation of compound exceeded the calibration range      DL = Detection Limit      Q = Surrogate failure  
 ND = Not detected at or above the DL      N = Recovery is out of criteria      P = The RPD between two GC columns exceeds 40%      J = Estimated result < LOQ and ≥ DL      L = LCS/LCSD failure  
 H = Out of holding time      W = Reported on wet weight basis      S = MS/MSD failure

Pace Analytical Services, LLC (formerly Shealy Environmental Services, Inc.)  
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## QC Summary

PFAS by LC/MS/MS - MB

Sample ID: WQ13393-001

Matrix: Solid

Batch: 13393

Prep Method: SOP SPE

Analytical Method: PFAS by ID SOP

Prep Date: 08/26/2021 1150

Parameter	Result	Q	Dil	LOQ	MDL	Units	Analysis Date
6:2 FTS	ND		1	2.0	0.31	ug/kg	08/27/2021 1438
PFHpA	ND		1	1.0	0.14	ug/kg	08/27/2021 1438
PFHxA	ND		1	1.0	0.18	ug/kg	08/27/2021 1438
PFOA	ND		1	1.0	0.21	ug/kg	08/27/2021 1438
PFPeA	ND		1	1.0	0.16	ug/kg	08/27/2021 1438
PFOS	ND		1	1.0	0.36	ug/kg	08/27/2021 1438
Surrogate	Q	% Rec	Acceptance Limit				
13C2_6:2FTS		93	25-150				
13C4_PFHpA		97	25-150				
13C5_PFHxA		99	25-150				
13C5_PFPeA		92	25-150				
13C8_PFOA		102	25-150				
13C8_PFOS		91	25-150				

LOQ = Limit of Quantitation

ND = Not detected at or above the DL

N = Recovery is out of criteria

DL = Detection Limit

J = Estimated result < LOQ and ≥ DL

P = The RPD between two GC columns exceeds 40%

\* = RSD is out of criteria

+ = RPD is out of criteria

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

PFAS by LC/MS/MS - LCS

Sample ID: WQ13393-002

Matrix: Solid

Batch: 13393

Prep Method: SOP SPE

Analytical Method: PFAS by ID SOP

Prep Date: 08/26/2021 1150

Parameter	Spike Amount (ug/kg)	Result (ug/kg)	Q	Dil	% Rec	%Rec Limit	Analysis Date
6:2 FTS	1.9	2.0		1	105	50-150	08/27/2021 1448
PFHpA	2.0	1.9		1	96	50-150	08/27/2021 1448
PFHxA	2.0	1.9		1	93	50-150	08/27/2021 1448
PFOA	2.0	1.9		1	96	50-150	08/27/2021 1448
PFPeA	2.0	1.9		1	93	50-150	08/27/2021 1448
PFOS	1.9	1.7		1	91	50-150	08/27/2021 1448
Surrogate	Q	% Rec	Acceptance Limit				
13C2_6:2FTS		95	25-150				
13C4_PFHpA		100	25-150				
13C5_PFHxA		101	25-150				
13C5_PFPeA		95	25-150				
13C8_PFOA		98	25-150				
13C8_PFOS		92	25-150				

LOQ = Limit of Quantitation

ND = Not detected at or above the DL

N = Recovery is out of criteria

DL = Detection Limit

J = Estimated result < LOQ and  $\geq$  DL

P = The RPD between two GC columns exceeds 40%

\* = RSD is out of criteria

+ = RPD is out of criteria

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

PFAS by LC/MS/MS - MB

Sample ID: WQ14782-001

Matrix: Aqueous

Batch: 14782

Prep Method: SOP SPE

Analytical Method: PFAS by ID SOP

Prep Date: 09/08/2021 1730

Parameter	Result	Q	Dil	LOQ	MDL	Units	Analysis Date
6:2 FTS	ND		1	8.0	2.0	ng/L	09/09/2021 1411
PFHpA	ND		1	4.0	0.45	ng/L	09/09/2021 1411
PFHxA	ND		1	4.0	0.69	ng/L	09/09/2021 1411
PFOA	ND		1	4.0	0.83	ng/L	09/09/2021 1411
PFPeA	ND		1	4.0	0.54	ng/L	09/09/2021 1411
PFOS	ND		1	4.0	2.0	ng/L	09/09/2021 1411
Surrogate	Q	% Rec	Acceptance Limit				
13C2_6:2FTS		90	25-150				
13C4_PFHpA		81	25-150				
13C5_PFHxA		87	25-150				
13C5_PFPeA		95	25-150				
13C8_PFOA		79	25-150				
13C8_PFOS		95	25-150				

LOQ = Limit of Quantitation

ND = Not detected at or above the DL

N = Recovery is out of criteria

DL = Detection Limit

J = Estimated result < LOQ and ≥ DL

P = The RPD between two GC columns exceeds 40%

\* = RSD is out of criteria

+ = RPD is out of criteria

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

PFAS by LC/MS/MS - LCS

Sample ID: WQ14782-002

Matrix: Aqueous

Batch: 14782

Prep Method: SOP SPE

Analytical Method: PFAS by ID SOP

Prep Date: 09/08/2021 1730

Parameter	Spike Amount (ng/L)	Result (ng/L)	Q	Dil	% Rec	%Rec Limit	Analysis Date
6:2 FTS	15	16		1	106	50-150	09/09/2021 1422
PFHpA	16	16		1	101	50-150	09/09/2021 1422
PFHxA	16	16		1	102	50-150	09/09/2021 1422
PFOA	16	18		1	110	50-150	09/09/2021 1422
PFPeA	16	18		1	111	50-150	09/09/2021 1422
PFOS	15	16		1	107	50-150	09/09/2021 1422
Surrogate	Q	% Rec	Acceptance Limit				
13C2_6:2FTS		89	25-150				
13C4_PFHpA		84	25-150				
13C5_PFHxA		87	25-150				
13C5_PFPeA		87	25-150				
13C8_PFOA		80	25-150				
13C8_PFOS		78	25-150				

LOQ = Limit of Quantitation

ND = Not detected at or above the DL

N = Recovery is out of criteria

DL = Detection Limit

J = Estimated result < LOQ and  $\geq$  DL

P = The RPD between two GC columns exceeds 40%

\* = RSD is out of criteria

+ = RPD is out of criteria

Note: Calculations are performed before rounding to avoid round-off errors in calculated results



Chain of Custody  
and  
Miscellaneous Documents





**Samples Receipt Checklist (SRC) (ME0018C-15)**  
Issuing Authority: Pace ENV - WCOL

Revised: 9/29/2020  
Page 1 of 1

## Sample Receipt Checklist (SRC)

Client: GZA Cooler Inspected by/date: KDRW / 8/17/2021 Lot #: W1117017

Means of receipt: <input type="checkbox"/> Pace <input type="checkbox"/> Client <input type="checkbox"/> UPS <input checked="" type="checkbox"/> FedEx <input type="checkbox"/> Other: _____	
<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	1. Were custody seals present on the cooler?
<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> NA	2. If custody seals were present, were they intact and unbroken?
pH Strip ID: <u>NA</u> Chlorine Strip ID: <u>NA</u> Tested by: <u>NA</u>	
Original temperature upon receipt / Derived (Corrected) temperature upon receipt %Solid Snap-Cup ID: <u>21-1425</u> <u>4.7 / 4.7</u> °C <u>NA / NA</u> °C <u>NA / NA</u> °C <u>NA / NA</u> °C	
Method: <input type="checkbox"/> Temperature Blank <input checked="" type="checkbox"/> Against Bottles IR Gun ID: <u>5</u> IR Gun Correction Factor: <u>0</u> °C	
Method of coolant: <input checked="" type="checkbox"/> Wet Ice <input type="checkbox"/> Ice Packs <input type="checkbox"/> Dry Ice <input type="checkbox"/> None	
<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> NA	3. If temperature of any cooler exceeded 6.0°C, was Project Manager Notified? PM was Notified by: phone / email / face-to-face (circle one).
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA	4. Is the commercial courier's packing slip attached to this form?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	5. Were proper custody procedures (relinquished/received) followed?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	6. Were sample IDs listed on the COC?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	7. Were sample IDs listed on all sample containers?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	8. Was collection date & time listed on the COC?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	9. Was collection date & time listed on all sample containers?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	10. Did all container label information (ID, date, time) agree with the COC?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	11. Were tests to be performed listed on the COC?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	12. Did all samples arrive in the proper containers for each test and/or in good condition (unbroken, lids on, etc.)? _____
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	13. Was adequate sample volume available?
<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	14. Were all samples received within ½ the holding time or 48 hours, whichever comes first?
<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	15. Were any samples containers missing/excess (circle one) samples Not listed on COC?
<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> NA	16. For VOA and RSK-175 samples, were bubbles present >"pea-size" (¼" or 6mm in diameter) in any of the VOA vials?
<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> NA	17. Were all DRO/metals/nutrient samples received at a pH of < 2?
<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> NA	18. Were all cyanide samples received at a pH > 12 and sulfide samples received at a pH > 9?
<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> NA	19. Were all applicable NH <sub>3</sub> /TKN/cyanide/phenol/625.1/608.3 (< 0.5mg/L) samples free of residual chlorine?
<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> NA	20. Were client remarks/requests (i.e. requested dilutions, MS/MSD designations, etc...) correctly transcribed from the COC into the comment section in LIMS?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	21. Was the quote number listed on the container label? If yes, Quote # <u>24164</u>
<b>Sample Preservation (Must be completed for any sample(s) incorrectly preserved or with headspace.)</b>	
Sample(s) <u>NA</u> were received incorrectly preserved and were adjusted accordingly in sample receiving with <u>NA</u> mL of circle one: H <sub>2</sub> SO <sub>4</sub> , HNO <sub>3</sub> , HCl, NaOH using SR # <u>NA</u>	
Time of preservation <u>NA</u> . If more than one preservative is needed, please note in the comments below.	
Sample(s) <u>NA</u> were received with bubbles >6 mm in diameter.	
Sample(s) <u>NA</u> were received with TRC > 0.5 mg/L (If #19 is <i>no</i> ) and were adjusted accordingly in sample receiving with sodium thiosulfate (Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> ) with Shealy ID: <u>NA</u>	
SR barcode labels applied by: <u>JSM</u> Date: <u>8/17/2021</u>	

Comments:  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



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## Report of Analysis

**GZA GeoEnvironmental, Inc.**  
17975 West Sarah Lane, Suite 100  
Brookfield, WI 53045  
Attention: Kevin Hedinger

Project Name: Oshkosh GW PFAS Sampling

Project Number: 20.0157080

Lot Number: **WH24026**

Date Completed: 09/20/2021

*Karen Coonan*

09/21/2021 2:29 PM

Approved and released by:  
Project Manager II: **Karen L. Coonan**



The electronic signature above is the equivalent of a handwritten signature.  
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# PACE ANALYTICAL SERVICES, LLC

SC DHEC No: 32010001

NELAC No: E87653

NC DENR No: 329

NC Field Parameters No: 5639

## **Case Narrative GZA GeoEnvironmental, Inc. Lot Number: WH24026**

This Report of Analysis contains the analytical result(s) for the sample(s) listed on the Sample Summary following this Case Narrative. The sample receiving date is documented in the header information associated with each sample.

All results listed in this report relate only to the samples that are contained within this report.

Sample receipt, sample analysis, and data review have been performed in accordance with the most current approved The NELAC Institute (TNI) standards, the Pace Analytical Services, LLC ("Pace") Laboratory Quality Manual, standard operating procedures (SOPs), and Pace policies. Any exceptions to the TNI standards, the Laboratory Quality Manual, SOPs or policies are qualified on the results page or discussed below.

If you have any questions regarding this report please contact the Pace Project Manager listed on the cover page.

Surrogate recovery for the following sample was outside the upper control limit: WH24026-002. This sample did not contain any target analytes; therefore, re-extraction and/or re-analysis was not performed.

# PACE ANALYTICAL SERVICES, LLC

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Sample Summary  
GZA GeoEnvironmental, Inc.  
Lot Number: WH24026  
Project Name: Oshkosh GW PFAS Sampling  
Project Number: 20.0157080

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Sample Number	Sample ID	Matrix	Date Sampled	Date Received
001	WP-MW-1	Aqueous	08/19/2021 1810	08/24/2021
002	Field Blank	Aqueous	08/19/2021 1820	08/24/2021

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(2 samples)

# PACE ANALYTICAL SERVICES, LLC

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Detection Summary  
GZA GeoEnvironmental, Inc.  
Lot Number: WH24026  
Project Name: Oshkosh GW PFAS Sampling  
Project Number: 20.0157080

Sample	Sample ID	Matrix	Parameter	Method	Result	Q	Units	Page
001	WP-MW-1	Aqueous	6:2 FTS	PFAS by ID	200		ng/L	5
001	WP-MW-1	Aqueous	PFBS	PFAS by ID	10	J	ng/L	5
001	WP-MW-1	Aqueous	PFHxS	PFAS by ID	23	J	ng/L	5
001	WP-MW-1	Aqueous	PFBA	PFAS by ID	3800		ng/L	5
001	WP-MW-1	Aqueous	PFHpA	PFAS by ID	1300		ng/L	5
001	WP-MW-1	Aqueous	PFHxA	PFAS by ID	7900		ng/L	5
001	WP-MW-1	Aqueous	PFOA	PFAS by ID	120		ng/L	5
001	WP-MW-1	Aqueous	PFPeA	PFAS by ID	19000		ng/L	5
002	Field Blank	Aqueous	PFBA	PFAS by ID	0.66	J	ng/L	7
002	Field Blank	Aqueous	PFOS	PFAS by ID	2.4	J	ng/L	7

(10 detections)

# PFAS by LC/MS/MS

Client: GZA GeoEnvironmental, Inc.	Laboratory ID: WH24026-001
Description: WP-MW-1	Matrix: Aqueous
Date Sampled: 08/19/2021 1810	Project Name: Oshkosh GW PFAS Sampling
Date Received: 08/24/2021	Project Number: 20.0157080

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	SOP SPE	PFAS by ID SOP	20	09/15/2021 1842	MMM	09/13/2021 1227	15147
2	SOP SPE	PFAS by ID SOP	50	09/18/2021 2100	NK1	09/13/2021 1227	15147

Parameter	CAS Number	Analytical Method	Result	Q	LOQ	MDL	Units	Run
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	756426-58-1	PFAS by ID SOP	ND		160	9.4	ng/L	1
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3...)	763051-92-9	PFAS by ID SOP	ND		160	13	ng/L	1
1H, 1H, 2H, 2H-perfluorodecane sulfonic acid (8:2 FTS)	39108-34-4	PFAS by ID SOP	ND		160	31	ng/L	1
1H, 1H, 2H, 2H-perfluorooctane sulfonic acid (6:2 FTS)	27619-97-2	PFAS by ID SOP	200		160	39	ng/L	1
1H,1H,2H,2H-perfluorohexane sulfonic acid (4:2 FTS)	757124-72-4	PFAS by ID SOP	ND		160	17	ng/L	1
Hexafluoropropylene oxide dimer acid (GenX)	13252-13-6	PFAS by ID SOP	ND		160	41	ng/L	1
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	919005-14-4	PFAS by ID SOP	ND		160	9.4	ng/L	1
N-ethylperfluoro-1-octanesulfonamide (EtFOSA)	4151-50-2	PFAS by ID SOP	ND		160	26	ng/L	1
N-ethylperfluoro-1-octanesulfonamidoacetic acid (EtFOSAA)	2991-50-6	PFAS by ID SOP	ND		160	15	ng/L	1
2-N-ethylperfluoro-1-octanesulfonamido-ethanol (EtFOSE)	1691-99-2	PFAS by ID SOP	ND		160	19	ng/L	1
N-methylperfluoro-1-octanesulfonamide (MeFOSA)	31506-32-8	PFAS by ID SOP	ND		310	25	ng/L	1
N-methylperfluoro-1-octanesulfonamidoacetic acid (MeFOSAA)	2355-31-9	PFAS by ID SOP	ND		160	18	ng/L	1
2-N-methylperfluoro-1-octanesulfonamido-ethanol (MeFOSE)	24448-09-7	PFAS by ID SOP	ND		160	25	ng/L	1
Perfluoro-1-butanefluoronic acid (PFBS)	375-73-5	PFAS by ID SOP	10	J	78	8.1	ng/L	1
Perfluoro-1-decanesulfonic acid (PFDS)	335-77-3	PFAS by ID SOP	ND		78	15	ng/L	1
Perfluoro-1-heptanesulfonic acid (PFHpS)	375-92-8	PFAS by ID SOP	ND		78	9.7	ng/L	1
Perfluoro-1-nonanesulfonic acid (PFNS)	68259-12-1	PFAS by ID SOP	ND		78	14	ng/L	1
Perfluoro-1-octanesulfonamide (PFOSA)	754-91-6	PFAS by ID SOP	ND		78	12	ng/L	1
Perfluoro-1-pentanesulfonic acid (PFPeS)	2706-91-4	PFAS by ID SOP	ND		78	12	ng/L	1
Perfluorododecanesulfonic acid (PFDOS)	79780-39-5	PFAS by ID SOP	ND		160	20	ng/L	1
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	PFAS by ID SOP	23	J	78	11	ng/L	1
Perfluoro-n-butyric acid (PFBA)	375-22-4	PFAS by ID SOP	3800		78	12	ng/L	1
Perfluoro-n-decanoic acid (PFDA)	335-76-2	PFAS by ID SOP	ND		78	10	ng/L	1
Perfluoro-n-dodecanoic acid (PFDoA)	307-55-1	PFAS by ID SOP	ND		78	9.2	ng/L	1
Perfluoro-n-heptanoic acid (PFHpA)	375-85-9	PFAS by ID SOP	1300		78	8.7	ng/L	1
Perfluoro-n-hexanoic acid (PFHxA)	307-24-4	PFAS by ID SOP	7900		78	13	ng/L	1
Perfluoro-n-nonanoic acid (PFNA)	375-95-1	PFAS by ID SOP	ND		78	9.0	ng/L	1
Perfluoro-n-octanoic acid (PFOA)	335-67-1	PFAS by ID SOP	120		78	16	ng/L	1
Perfluoro-n-pentanoic acid (PFPeA)	2706-90-3	PFAS by ID SOP	19000		200	27	ng/L	2
Perfluoro-n-tetradecanoic acid (PFTeDA)	376-06-7	PFAS by ID SOP	ND		78	12	ng/L	1
Perfluoro-n-tridecanoic acid (PFTrDA)	72629-94-8	PFAS by ID SOP	ND		78	10	ng/L	1
Perfluoro-n-undecanoic acid (PFUDA)	2058-94-8	PFAS by ID SOP	ND		78	12	ng/L	1
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	PFAS by ID SOP	ND		78	39	ng/L	1

Surrogate	Q	Run 1 % Recovery	Acceptance Limits	Q	Run 2 % Recovery	Acceptance Limits
13C2_4:2FTS		125	25-150		100	25-150
13C2_6:2FTS		145	25-150		101	25-150
13C2_8:2FTS		116	25-150		96	25-150
13C2_PFDaA		112	25-150		114	25-150
13C2_PFTeDA		113	25-150		101	25-150
13C3_PFBs		107	25-150		98	25-150
13C3_PFHxS		100	25-150		94	25-150
13C3-HFPO-DA		118	25-150		96	25-150

LOQ = Limit of Quantitation      B = Detected in the method blank      E = Quantitation of compound exceeded the calibration range      DL = Detection Limit      Q = Surrogate failure  
 ND = Not detected at or above the DL      N = Recovery is out of criteria      P = The RPD between two GC columns exceeds 40%      J = Estimated result < LOQ and ≥ DL      L = LCS/LCSD failure  
 H = Out of holding time      W = Reported on wet weight basis      S = MS/MSD failure

Pace Analytical Services, LLC (formerly Shealy Environmental Services, Inc.)  
 106 Vantage Point Drive West Columbia, SC 29172 (803) 791-9700 Fax (803) 791-9111 www.pacelabs.com



# PFAS by LC/MS/MS

Client: GZA GeoEnvironmental, Inc.	Laboratory ID: WH24026-001
Description: WP-MW-1	Matrix: Aqueous
Date Sampled: 08/19/2021 1810	Project Name: Oshkosh GW PFAS Sampling
Date Received: 08/24/2021	Project Number: 20.0157080

Surrogate	Q	Run 1 % Recovery	Acceptance Limits	Q	Run 2 % Recovery	Acceptance Limits
13C4_PFBa		105	25-150		93	25-150
13C4_PFHpA		119	25-150		98	25-150
13C5_PFHxA		104	25-150		95	25-150
13C5_PFPeA		96	25-150		95	25-150
13C6_PFDA		99	25-150		102	25-150
13C7_PFUdA		108	25-150		99	25-150
13C8_PFOA		115	25-150		98	25-150
13C8_PFOS		91	25-150		93	25-150
13C8_PFOSA		99	10-150		97	10-150
13C9_PFNA		115	25-150		103	25-150
d-EtFOSA		111	10-150		97	10-150
d5-EtFOSAA		104	25-150		107	25-150
d9-EtFOSE		115	10-150		95	10-150
d-MeFOSA		98	10-150		88	10-150
d3-MeFOSAA		99	25-150		99	25-150
d7-MeFOSE		98	10-150		108	10-150

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LOQ = Limit of Quantitation      B = Detected in the method blank      E = Quantitation of compound exceeded the calibration range      DL = Detection Limit      Q = Surrogate failure  
 ND = Not detected at or above the DL      N = Recovery is out of criteria      P = The RPD between two GC columns exceeds 40%      J = Estimated result < LOQ and ≥ DL      L = LCS/LCSD failure  
 H = Out of holding time      W = Reported on wet weight basis      S = MS/MSD failure

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Pace Analytical Services, LLC (formerly Shealy Environmental Services, Inc.)  
 106 Vantage Point Drive West Columbia, SC 29172 (803) 791-9700 Fax (803) 791-9111 www.pacelabs.com

# PFAS by LC/MS/MS

Client: GZA GeoEnvironmental, Inc.	Laboratory ID: WH24026-002
Description: Field Blank	Matrix: Aqueous
Date Sampled: 08/19/2021 1820	Project Name: Oshkosh GW PFAS Sampling
Date Received: 08/24/2021	Project Number: 20.0157080

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	SOP SPE	PFAS by ID SOP	1	09/15/2021 1853	MMM	09/13/2021 1227	15147

Parameter	CAS Number	Analytical Method	Result	Q	LOQ	MDL	Units	Run
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9Cl-PF3ONS)	756426-58-1	PFAS by ID SOP	ND		8.5	0.51	ng/L	1
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3...)	763051-92-9	PFAS by ID SOP	ND		8.5	0.71	ng/L	1
1H, 1H, 2H, 2H-perfluorodecane sulfonic acid (8:2 FTS)	39108-34-4	PFAS by ID SOP	ND		8.5	1.7	ng/L	1
1H, 1H, 2H, 2H-perfluorooctane sulfonic acid (6:2 FTS)	27619-97-2	PFAS by ID SOP	ND	Q	8.5	2.1	ng/L	1
1H,1H,2H,2H-perfluorohexane sulfonic acid (4:2 FTS)	757124-72-4	PFAS by ID SOP	ND		8.5	0.93	ng/L	1
Hexafluoropropylene oxide dimer acid (GenX)	13252-13-6	PFAS by ID SOP	ND		8.5	2.2	ng/L	1
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	919005-14-4	PFAS by ID SOP	ND		8.5	0.52	ng/L	1
N-ethylperfluoro-1-octanesulfonamide (EtFOSA)	4151-50-2	PFAS by ID SOP	ND		8.5	1.4	ng/L	1
N-ethylperfluoro-1-octanesulfonamidoacetic acid (EtFOSAA)	2991-50-6	PFAS by ID SOP	ND		8.5	0.80	ng/L	1
2-N-ethylperfluoro-1-octanesulfonamido-ethanol (EtFOSE)	1691-99-2	PFAS by ID SOP	ND		8.5	1.0	ng/L	1
N-methylperfluoro-1-octanesulfonamide (MeFOSA)	31506-32-8	PFAS by ID SOP	ND		17	1.3	ng/L	1
N-methylperfluoro-1-octanesulfonamidoacetic acid (MeFOSAA)	2355-31-9	PFAS by ID SOP	ND		8.5	1.0	ng/L	1
2-N-methylperfluoro-1-octanesulfonamido-ethanol (MeFOSE)	24448-09-7	PFAS by ID SOP	ND		8.5	1.4	ng/L	1
Perfluoro-1-butanefluoronic acid (PFBS)	375-73-5	PFAS by ID SOP	ND		4.3	0.44	ng/L	1
Perfluoro-1-decanesulfonic acid (PFDS)	335-77-3	PFAS by ID SOP	ND		4.3	0.83	ng/L	1
Perfluoro-1-heptanesulfonic acid (PFHpS)	375-92-8	PFAS by ID SOP	ND		4.3	0.53	ng/L	1
Perfluoro-1-nonanesulfonic acid (PFNS)	68259-12-1	PFAS by ID SOP	ND		4.3	0.76	ng/L	1
Perfluoro-1-octanesulfonamide (PFOSA)	754-91-6	PFAS by ID SOP	ND		4.3	0.65	ng/L	1
Perfluoro-1-pentanesulfonic acid (PFPeS)	2706-91-4	PFAS by ID SOP	ND		4.3	0.63	ng/L	1
Perfluorododecanesulfonic acid (PFDOS)	79780-39-5	PFAS by ID SOP	ND		8.5	1.1	ng/L	1
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	PFAS by ID SOP	ND		4.3	0.59	ng/L	1
Perfluoro-n-butyanoic acid (PFBA)	375-22-4	PFAS by ID SOP	0.66	J	4.3	0.64	ng/L	1
Perfluoro-n-decanoic acid (PFDA)	335-76-2	PFAS by ID SOP	ND		4.3	0.56	ng/L	1
Perfluoro-n-dodecanoic acid (PFDoA)	307-55-1	PFAS by ID SOP	ND		4.3	0.50	ng/L	1
Perfluoro-n-heptanoic acid (PFHpA)	375-85-9	PFAS by ID SOP	ND		4.3	0.48	ng/L	1
Perfluoro-n-hexanoic acid (PFHxA)	307-24-4	PFAS by ID SOP	ND		4.3	0.73	ng/L	1
Perfluoro-n-nonanoic acid (PFNA)	375-95-1	PFAS by ID SOP	ND		4.3	0.49	ng/L	1
Perfluoro-n-octanoic acid (PFOA)	335-67-1	PFAS by ID SOP	ND		4.3	0.89	ng/L	1
Perfluoro-n-pentanoic acid (PFPeA)	2706-90-3	PFAS by ID SOP	ND		4.3	0.58	ng/L	1
Perfluoro-n-tetradecanoic acid (PFTeDA)	376-06-7	PFAS by ID SOP	ND		4.3	0.64	ng/L	1
Perfluoro-n-tridecanoic acid (PFTrDA)	72629-94-8	PFAS by ID SOP	ND		4.3	0.57	ng/L	1
Perfluoro-n-undecanoic acid (PFUDA)	2058-94-8	PFAS by ID SOP	ND		4.3	0.67	ng/L	1
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	PFAS by ID SOP	2.4	J	4.3	2.1	ng/L	1

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C2_4:2FTS		115	25-150
13C2_6:2FTS	N	252	25-150
13C2_8:2FTS		86	25-150
13C2_PFDaA		82	25-150
13C2_PFTeDA		87	25-150
13C3_PFBs		89	25-150
13C3_PFHxS		91	25-150
13C3-HFPO-DA		94	25-150
13C4_PFBa		97	25-150

LOQ = Limit of Quantitation      B = Detected in the method blank      E = Quantitation of compound exceeded the calibration range      DL = Detection Limit      Q = Surrogate failure  
 ND = Not detected at or above the DL      N = Recovery is out of criteria      P = The RPD between two GC columns exceeds 40%      J = Estimated result < LOQ and ≥ DL      L = LCS/LCSD failure  
 H = Out of holding time      W = Reported on wet weight basis      S = MS/MSD failure

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# PFAS by LC/MS/MS

Client: GZA GeoEnvironmental, Inc.	Laboratory ID: WH24026-002
Description: Field Blank	Matrix: Aqueous
Date Sampled: 08/19/2021 1820	Project Name: Oshkosh GW PFAS Sampling
Date Received: 08/24/2021	Project Number: 20.0157080

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
13C4_PFHpA		90	25-150
13C5_PFHxA		93	25-150
13C5_PFPeA		99	25-150
13C6_PFDA		85	25-150
13C7_PFUdA		83	25-150
13C8_PFOA		96	25-150
13C8_PFOS		80	25-150
13C8_PFOSA		82	10-150
13C9_PFNA		97	25-150
d-EtFOSA		60	10-150
d5-EtFOSAA		90	25-150
d9-EtFOSE		87	10-150
d-MeFOSA		72	10-150
d3-MeFOSAA		99	25-150
d7-MeFOSE		82	10-150

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LOQ = Limit of Quantitation      B = Detected in the method blank      E = Quantitation of compound exceeded the calibration range      DL = Detection Limit      Q = Surrogate failure  
 ND = Not detected at or above the DL      N = Recovery is out of criteria      P = The RPD between two GC columns exceeds 40%      J = Estimated result < LOQ and ≥ DL      L = LCS/LCSD failure  
 H = Out of holding time      W = Reported on wet weight basis      S = MS/MSD failure

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## QC Summary

PFAS by LC/MS/MS - MB

Sample ID: WQ15147-001

Matrix: Aqueous

Batch: 15147

Prep Method: SOP SPE

Analytical Method: PFAS by ID SOP

Prep Date: 09/13/2021 1227

Parameter	Result	Q	Dil	LOQ	MDL	Units	Analysis Date
9CI-PF3ONS	ND		1	8.0	0.48	ng/L	09/14/2021 1800
11CI-PF3OUdS	ND		1	8.0	0.66	ng/L	09/14/2021 1800
8:2 FTS	ND		1	8.0	1.6	ng/L	09/14/2021 1800
6:2 FTS	ND		1	8.0	2.0	ng/L	09/14/2021 1800
4:2 FTS	ND		1	8.0	0.87	ng/L	09/14/2021 1800
GenX	ND		1	8.0	2.1	ng/L	09/14/2021 1800
ADONA	ND		1	8.0	0.48	ng/L	09/14/2021 1800
EtFOSA	ND		1	8.0	1.4	ng/L	09/14/2021 1800
EtFOSAA	ND		1	8.0	0.75	ng/L	09/14/2021 1800
EtFOSE	ND		1	8.0	0.95	ng/L	09/14/2021 1800
MeFOSA	ND		1	16	1.3	ng/L	09/14/2021 1800
MeFOSAA	ND		1	8.0	0.93	ng/L	09/14/2021 1800
MeFOSE	ND		1	8.0	1.3	ng/L	09/14/2021 1800
PFBS	ND		1	4.0	0.41	ng/L	09/14/2021 1800
PFDS	ND		1	4.0	0.78	ng/L	09/14/2021 1800
PFHpS	ND		1	4.0	0.50	ng/L	09/14/2021 1800
PFNS	ND		1	4.0	0.71	ng/L	09/14/2021 1800
PFOSA	ND		1	4.0	0.61	ng/L	09/14/2021 1800
PFPeS	ND		1	4.0	0.59	ng/L	09/14/2021 1800
PFDOS	ND		1	8.0	1.0	ng/L	09/14/2021 1800
PFHxS	ND		1	4.0	0.55	ng/L	09/14/2021 1800
PFBA	ND		1	4.0	0.60	ng/L	09/14/2021 1800
PFDA	ND		1	4.0	0.52	ng/L	09/14/2021 1800
PFDoA	ND		1	4.0	0.47	ng/L	09/14/2021 1800
PFHpA	ND		1	4.0	0.45	ng/L	09/14/2021 1800
PFHxA	ND		1	4.0	0.69	ng/L	09/14/2021 1800
PFNA	ND		1	4.0	0.46	ng/L	09/14/2021 1800
PFOA	ND		1	4.0	0.83	ng/L	09/14/2021 1800
PFPeA	ND		1	4.0	0.54	ng/L	09/14/2021 1800
PFTeDA	ND		1	4.0	0.60	ng/L	09/14/2021 1800
PFTTrDA	ND		1	4.0	0.53	ng/L	09/14/2021 1800
PFUdA	ND		1	4.0	0.63	ng/L	09/14/2021 1800
PFOS	ND		1	4.0	2.0	ng/L	09/14/2021 1800

Surrogate	Q	% Rec	Acceptance Limit
13C2_4:2FTS		143	25-150
13C2_6:2FTS		92	25-150
13C2_8:2FTS		100	25-150
13C2_PFDoA		115	25-150
13C2_PFTeDA		126	25-150
13C3_PFBs		114	25-150
13C3_PFHxS		104	25-150
13C3-HFPO-DA		125	25-150

LOQ = Limit of Quantitation

ND = Not detected at or above the DL

N = Recovery is out of criteria

DL = Detection Limit

J = Estimated result < LOQ and ≥ DL

P = The RPD between two GC columns exceeds 40%

\* = RSD is out of criteria

+ = RPD is out of criteria

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

PFAS by LC/MS/MS - MB

Sample ID: WQ15147-001

Matrix: Aqueous

Batch: 15147

Prep Method: SOP SPE

Analytical Method: PFAS by ID SOP

Prep Date: 09/13/2021 1227

Surrogate	Q	% Rec	Acceptance Limit
13C4_PFBA		111	25-150
13C4_PFHpA		121	25-150
13C5_PFHxA		123	25-150
13C5_PFPeA		109	25-150
13C6_PFDA		115	25-150
13C7_PFUdA		118	25-150
13C8_PFOA		119	25-150
13C8_PFOS		128	25-150
13C8_PFOSA		105	10-150
13C9_PFNA		124	25-150
d-EtFOSA		104	10-150
d5-EtFOSAA		105	25-150
d9-EtFOSE		108	10-150
d-MeFOSA		107	10-150
d3-MeFOSAA		110	25-150
d7-MeFOSE		115	10-150

LOQ = Limit of Quantitation

ND = Not detected at or above the DL

N = Recovery is out of criteria

DL = Detection Limit

J = Estimated result < LOQ and  $\geq$  DL

P = The RPD between two GC columns exceeds 40%

\* = RSD is out of criteria

+ = RPD is out of criteria

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

PFAS by LC/MS/MS - LCS

Sample ID: WQ15147-002

Matrix: Aqueous

Batch: 15147

Prep Method: SOP SPE

Analytical Method: PFAS by ID SOP

Prep Date: 09/13/2021 1227

Parameter	Spike Amount (ng/L)	Result (ng/L)	Q	Dil	% Rec	%Rec Limit	Analysis Date
9CI-PF3ONS	15	13		1	88	50-150	09/14/2021 1810
11CI-PF3OUdS	15	13		1	88	50-150	09/14/2021 1810
8:2 FTS	15	13		1	83	50-150	09/14/2021 1810
6:2 FTS	15	15		1	102	50-150	09/14/2021 1810
4:2 FTS	15	15		1	100	50-150	09/14/2021 1810
GenX	32	25		1	79	50-150	09/14/2021 1810
ADONA	15	16		1	104	50-150	09/14/2021 1810
EtFOSA	16	17		1	105	50-150	09/14/2021 1810
EtFOSAA	16	16		1	103	50-150	09/14/2021 1810
EtFOSE	16	16		1	102	50-150	09/14/2021 1810
MeFOSA	16	18		1	114	50-150	09/14/2021 1810
MeFOSAA	16	16		1	97	50-150	09/14/2021 1810
MeFOSE	16	14		1	89	50-150	09/14/2021 1810
PFBS	14	15		1	103	50-150	09/14/2021 1810
PFDS	15	13		1	87	50-150	09/14/2021 1810
PFHpS	15	16		1	104	50-150	09/14/2021 1810
PFNS	15	15		1	96	50-150	09/14/2021 1810
PFOSA	16	16		1	103	50-150	09/14/2021 1810
PFPeS	15	16		1	107	50-150	09/14/2021 1810
PFDOS	15	15		1	98	50-150	09/14/2021 1810
PFHxS	15	14		1	99	50-150	09/14/2021 1810
PFBA	16	17		1	107	50-150	09/14/2021 1810
PFDA	16	16		1	99	50-150	09/14/2021 1810
PFDoA	16	18		1	112	50-150	09/14/2021 1810
PFHpA	16	17		1	106	50-150	09/14/2021 1810
PFHxA	16	15		1	95	50-150	09/14/2021 1810
PFNA	16	16		1	97	50-150	09/14/2021 1810
PFOA	16	16		1	103	50-150	09/14/2021 1810
PFPeA	16	15		1	94	50-150	09/14/2021 1810
PFTeDA	16	18		1	112	50-150	09/14/2021 1810
PFTTrDA	16	16		1	103	50-150	09/14/2021 1810
PFUdA	16	18		1	110	50-150	09/14/2021 1810
PFOS	15	15		1	101	50-150	09/14/2021 1810
Surrogate	Q	% Rec	Acceptance Limit				
13C2_4:2FTS		141	25-150				
13C2_6:2FTS		91	25-150				
13C2_8:2FTS		104	25-150				
13C2_PFDoA		102	25-150				
13C2_PFTeDA		117	25-150				
13C3_PFBS		112	25-150				
13C3_PFHxS		108	25-150				
13C3-HFPO-DA		133	25-150				

LOQ = Limit of Quantitation

ND = Not detected at or above the DL

N = Recovery is out of criteria

DL = Detection Limit

J = Estimated result < LOQ and ≥ DL

P = The RPD between two GC columns exceeds 40%

\* = RSD is out of criteria

+ = RPD is out of criteria

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

PFAS by LC/MS/MS - LCS

Sample ID: WQ15147-002

Matrix: Aqueous

Batch: 15147

Prep Method: SOP SPE

Analytical Method: PFAS by ID SOP

Prep Date: 09/13/2021 1227

Surrogate	Q	% Rec	Acceptance Limit
13C4_PFBA		112	25-150
13C4_PFHpA		107	25-150
13C5_PFHxA		117	25-150
13C5_PFPeA		125	25-150
13C6_PFDA		122	25-150
13C7_PFUdA		104	25-150
13C8_PFOA		119	25-150
13C8_PFOS		111	25-150
13C8_PFOSA		99	10-150
13C9_PFNA		128	25-150
d-EtFOSA		90	10-150
d5-EtFOSAA		112	25-150
d9-EtFOSE		108	10-150
d-MeFOSA		101	10-150
d3-MeFOSAA		107	25-150
d7-MeFOSE		113	10-150

LOQ = Limit of Quantitation

ND = Not detected at or above the DL

N = Recovery is out of criteria

DL = Detection Limit

J = Estimated result < LOQ and  $\geq$  DL

P = The RPD between two GC columns exceeds 40%

\* = RSD is out of criteria

+ = RPD is out of criteria

Note: Calculations are performed before rounding to avoid round-off errors in calculated results



Chain of Custody  
and  
Miscellaneous Documents



# PACE ANALYTICAL SERVICES, LLC



**Samples Receipt Checklist (SRC) (ME0018C-15)**  
Issuing Authority: Pace ENV - WCOL

Revised: 9/29/2020  
Page 1 of 1

## Sample Receipt Checklist (SRC)

Client: GZA

Cooler Inspected by/date: JSM / 08/24/2021

Lot #: WH24026

Means of receipt: <input type="checkbox"/> Pace <input type="checkbox"/> Client <input type="checkbox"/> UPS <input checked="" type="checkbox"/> FedEx <input type="checkbox"/> Other: _____	
<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	1. Were custody seals present on the cooler?
<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> NA	2. If custody seals were present, were they intact and unbroken?
pH Strip ID: <u>NA</u>	Chlorine Strip ID: <u>NA</u> Tested by: <u>NA</u>
Original temperature upon receipt / Derived (Corrected) temperature upon receipt      %Solid Snap-Cup ID: <u>NA</u> <u>4.2 / 4.2 °C NA / NA °C NA / NA °C NA / NA °C</u>	
Method: <input checked="" type="checkbox"/> Temperature Blank <input type="checkbox"/> Against Bottles      IR Gun ID: <u>5</u> IR Gun Correction Factor: <u>0</u> °C	
Method of coolant: <input checked="" type="checkbox"/> Wet Ice <input type="checkbox"/> Ice Packs <input type="checkbox"/> Dry Ice <input type="checkbox"/> None	
<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> NA	3. If temperature of any cooler exceeded 6.0°C, was Project Manager Notified? PM was Notified by: phone / email / face-to face (circle one).
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA	4. Is the commercial courier's packing slip attached to this form?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	5. Were proper custody procedures (relinquished/received) followed?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	6. Were sample IDs listed on the COC?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	7. Were sample IDs listed on all sample containers?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	8. Was collection date & time listed on the COC?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	9. Was collection date & time listed on all sample containers?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	10. Did all container label information (ID, date, time) agree with the COC?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	11. Were tests to be performed listed on the COC?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	12. Did all samples arrive in the proper containers for each test and/or in good condition (unbroken, lids on, etc.)?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	13. Was adequate sample volume available?
<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	14. Were all samples received within ½ the holding time or 48 hours, whichever comes first?
<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	15. Were any samples containers missing/excess (circle one) samples Not listed on COC?
<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> NA	16. For VOA and RSK-175 samples, were bubbles present > "pea-size" (¼" or 6mm in diameter) in any of the VOA vials?
<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> NA	17. Were all DRO/metals/nutrient samples received at a pH of < 2?
<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> NA	18. Were all cyanide samples received at a pH > 12 and sulfide samples received at a pH > 9?
<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> NA	19. Were all applicable NH <sub>3</sub> /TKN/cyanide/phenol/625.1/608.3 (< 0.5mg/L) samples free of residual chlorine?
<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> NA	20. Were client remarks/requests (i.e. requested dilutions, MS/MSD designations, etc...) correctly transcribed from the COC into the comment section in LIMS?
<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	21. Was the quote number listed on the container label? If yes, Quote #
<b>Sample Preservation</b> (Must be completed for any sample(s) incorrectly preserved or with headspace.)	
Sample(s) <u>NA</u> were received incorrectly preserved and were adjusted accordingly in sample receiving with <u>NA</u> mL of circle one: H2SO4, HNO3, HCl, NaOH using SR # <u>NA</u> .	
Time of preservation <u>NA</u> . If more than one preservative is needed, please note in the comments below.	
Sample(s) <u>NA</u> were received with bubbles > 6 mm in diameter.	
Sample(s) <u>NA</u> were received with TRC > 0.5 mg/L (if #19 is <i>no</i> ) and were adjusted accordingly in sample receiving with sodium thiosulfate (Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> ) with Shealy ID: <u>NA</u> .	
SR barcode labels applied by: <u>JSM</u> Date: <u>08/24/2021</u>	
Comments:	