NAVFAC
Naval Facilities Engineering Command

Groundwater Sample Results, Level 2 Laboratory Report, Electronic Data Deliverable, Data Validation Report, Location Report, SDG 2001444

MCAS
Tustin, CA

April 2021

July 30, 2020

Vista Work Order No. 2001444

Ms. Kimberly Shiroodi
KMEA
2423 Hoover Avenue
National City, CA 91950

Dear Ms. Shiroodi,

Enclosed are the results for the sample set received at Vista Analytical Laboratory on July 10, 2020 under your Project Name 'MCAS El Toro and Tustin, PFAS'.

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

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

Sincerely,

Martha Maier
Laboratory Director

Vista Work Order No. 2001444
Case Narrative

Sample Condition on Receipt:

One blank water sample and seven groundwater samples were received in good condition and within the method temperature requirements. The samples were received and stored securely in accordance with Vista standard operating procedures and EPA methodology.

Analytical Notes:

PFAS Isotope Dilution/LC-MSMS Method Compliant with Table B-15 of QSM 5.3 (Aqueous)

The following samples contained particulate and were centrifuged prior to extraction:

Laboratory ID	Sample Name
2001444-02	TW27S-20200709
2001444-03	TW22S-20200709
2001444-04	TW10D-20200709
2001444-05	TW11D-20200709
2001444-06	TW12D-20200709
2001444-07	TW13D-20200709
2001444-08	TW14D-20200709

The samples were extracted and analyzed for a selected list of PFAS using Isotope Dilution and LC-MS/MS compliant with Table B-15 of QSM 5.3. The results for PFHxS, PFOA, PFOS, MeFOSAA and EtFOSAA include both linear and branched isomers. Results for all other analytes include the linear isomers only.

Holding Times

The samples were extracted and analyzed within the hold times.

Quality Control

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

A Method Blank and Laboratory Control Sample (LCS)/Laboratory Control Sample Duplicate (LCSD) were extracted and analyzed with the preparation batch. No analytes were detected in the Method Blank above 1/2 of the LOQ concentrations. The LCS/LCSD recoveries were within the acceptance criteria.

The labeled standard recoveries outside the acceptance criteria are flagged with an "H' qualifier.

TABLE OF CONTENTS

Sample Inventory Report

Vista Sample ID	Client Sample ID	Sampled	Received	Components/Containers
2001444-01	EB07-20200709	09-Jul-20 14:00	10-Jul-20 09:11	HDPE Bottle, 250 mL
				HDPE Bottle, 250 mL
2001444-02	TW27S-20200709	09-Jul-20 13:00	10-Jul-20 09:11	HDPE Bottle, 250 mL
				HDPE Bottle, 250 mL
				HDPE Bottle, 250 mL
				HDPE Bottle, 250 mL
2001444-03	TW22S-20200709	09-Jul-20 14:00	10-Jul-20 09:11	HDPE Bottle, 250 mL
				HDPE Bottle, 250 mL
				HDPE Bottle, 250 mL
				HDPE Bottle, 250 mL
2001444-04	TW10D-20200709	09-Jul-20 08:20	10-Jul-20 09:11	HDPE Bottle, 250 mL
				HDPE Bottle, 250 mL
				HDPE Bottle, 250 mL
				HDPE Bottle, 250 mL
2001444-05	TW11D-20200709	09-Jul-20 10:25	10-Jul-20 09:11	HDPE Bottle, 250 mL
				HDPE Bottle, 250 mL
				HDPE Bottle, 250 mL
				HDPE Bottle, 250 mL
				HDPE Bottle, 250 mL
2001444-06	TW12D-20200709	09-Jul-20 12:15	10-Jul-20 09:11	HDPE Bottle, 250 mL
				HDPE Bottle, 250 mL
				HDPE Bottle, 250 mL
				HDPE Bottle, 250 mL
2001444-07	TW13D-20200709	09-Jul-20 14:00	10-Jul-20 09:11	HDPE Bottle, 250 mL
				HDPE Bottle, 250 mL
				HDPE Bottle, 250 mL
				HDPE Bottle, 250 mL
2001444-08	TW14D-20200709	09-Jul-20 15:30	10-Jul-20 09:11	HDPE Bottle, 250 mL
				HDPE Bottle, 250 mL
				HDPE Bottle, 250 mL
				HDPE Bottle, 250 mL

ANALYTICAL RESULTS

Sample ID: Method Blank

PFAS Isotope Dilution Table B-15

Client Data

Name: KMEA
Project: MCAS El Toro and Tustin, PFAS
Matrix: Aqueous

Laboratory Data

Lab Sample: B0G0090-BLK1
Column: BEH C18

Analyte	CAS Number	Conc. (ug/L)	DL	LOD	LOQ	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
PFBS	375-73-5	ND	0.00137	0.00200	0.00400		B0G0090	19-Jul-20	0.250 L	21-Jul-20 20:22	1
PFHxA	307-24-4	ND	0.00137	0.00200	0.00400		B0G0090	19-Jul-20	0.250 L	21-Jul-20 20:22	1
HFPO-DA	13252-13-6	ND	0.00241	0.00300	0.00400		B0G0090	19-Jul-20	0.250 L	21-Jul-20 20:22	1
PFHpA	375-85-9	ND	0.00137	0.00200	0.00400		B0G0090	19-Jul-20	0.250 L	21-Jul-20 20:22	1
ADONA	919005-14-4	ND	0.00137	0.00200	0.00400		B0G0090	19-Jul-20	0.250 L	21-Jul-20 20:22	1
PFHxS	355-46-4	ND	0.00137	0.00200	0.00400		B0G0090	19-Jul-20	0.250 L	21-Jul-20 20:22	1
PFOA	335-67-1	ND	0.00137	0.00200	0.00400		B0G0090	19-Jul-20	0.250 L	21-Jul-20 20:22	1
PFNA	375-95-1	ND	0.00137	0.00200	0.00400		B0G0090	19-Jul-20	0.250 L	21-Jul-20 20:22	1
PFOS	1763-23-1	ND	0.00137	0.00200	0.00400		B0G0090	19-Jul-20	0.250 L	21-Jul-20 20:22	1
9Cl-PF3ONS	756426-58-1	ND	0.00137	0.00200	0.00400		B0G0090	19-Jul-20	0.250 L	21-Jul-20 20:22	1
PFDA	335-76-2	ND	0.00137	0.00200	0.00400		B0G0090	19-Jul-20	0.250 L	21-Jul-20 20:22	1
MeFOSAA	2355-31-9	ND	0.00137	0.00200	0.00400		B0G0090	19-Jul-20	0.250 L	21-Jul-20 20:22	1
EtFOSAA	2991-50-6	ND	0.00137	0.00200	0.00400		B0G0090	19-Jul-20	0.250 L	21-Jul-20 20:22	1
PFUnA	2058-94-8	ND	0.00137	0.00200	0.00400		B0G0090	19-Jul-20	0.250 L	21-Jul-20 20:22	1
11Cl-PF3OUdS	763051-92-9	ND	0.00137	0.00200	0.00400		B0G0090	19-Jul-20	0.250 L	21-Jul-20 20:22	1
PFDoA	307-55-1	ND	0.00137	0.00200	0.00400		B0G0090	19-Jul-20	0.250 L	21-Jul-20 20:22	1
PFTrDA	72629-94-8	ND	0.00137	0.00200	0.00400		B0G0090	19-Jul-20	0.250 L	21-Jul-20 20:22	1
PFTeDA	376-06-7	ND	0.00137	0.00200	0.00400		B0G0090	19-Jul-20	0.250 L	21-Jul-20 20:22	1

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
13C3-PFBS	IS	92.9	50 - 150		B0G0090	19-Jul-20	0.250 L	21-Jul-20 20:22	1
13C3-HFPO-DA	IS	75.6	50 - 150		B0G0090	19-Jul-20	0.250 L	21-Jul-20 20:22	1
13C2-PFHxA	IS	88.1	50 - 150		B0G0090	19-Jul-20	0.250 L	21-Jul-20 20:22	1
13C4-PFHpA	IS	88.1	50 - 150		B0G0090	19-Jul-20	0.250 L	21-Jul-20 20:22	1
13C3-PFHxS	IS	102	50 - 150		B0G0090	19-Jul-20	0.250 L	21-Jul-20 20:22	1
13C5-PFNA	IS	94.3	50 - 150		B0G0090	19-Jul-20	0.250 L	21-Jul-20 20:22	1
13C2-PFOA	IS	88.1	50 - 150		B0G0090	19-Jul-20	0.250 L	21-Jul-20 20:22	1
13C8-PFOS	IS	91.1	50 - 150		B0G0090	19-Jul-20	0.250 L	21-Jul-20 20:22	1
13C2-PFDA	IS	84.5	50 - 150		B0G0090	19-Jul-20	0.250 L	21-Jul-20 20:22	1
d3-MeFOSAA	IS	80.2	50 - 150		B0G0090	19-Jul-20	0.250 L	21-Jul-20 20:22	1
13C2-PFUnA	IS	77.3	50 - 150		B0G0090	19-Jul-20	0.250 L	21-Jul-20 20:22	1
d5-EtFOSAA	IS	81.3	50 - 150		B0G0090	19-Jul-20	0.250 L	21-Jul-20 20:22	1
13C2-PFDoA	IS	80.0	50 - 150		B0G0090	19-Jul-20	0.250 L	21-Jul-20 20:22	1
13C2-PFTeDA	IS	76.4	50 - 150		B0G0090	19-Jul-20	0.250 L	21-Jul-20 20:22	1

DL - Detection Limit
LOD - Limit of Detection
LOQ - Limit of quantitation

Results reported to the DL.

When reported, PFHxS, PFOA, PFOS, MeFOSAA and EtFOSAA include both linear and branched isomers. Only the linear isomer is reported for all other analytes.

Sample ID: LCSD **PFAS Isotope Dilution Table B-15**

Name:	KMEA	Lab Sample:	B0G0090-BS1/B0G0090-BSD1
Project:	MCAS El Toro and Tustin, PFAS	QC Batch:	B0G0090
Matrix:	Aqueous	Samp Size:	0.250/0.250 L
		Date Extracted:	19-Jul-20
		Column:	BEH C18

Analyte	CAS Number	LCS (ug/L)	LCS Spike	LCS % Rec	LCS Quals	LCSD (ug/L)	LCSD Spike	LCSD % Rec	RPD	LCSD Quals	%Rec Limits	RPD Limits	LCS Analyzed	LCS Dil	LCSD Analyzed	LCSD Dil
PFBS	375-73-5	0.0413	0.0400	103		0.0386	0.0400	96.5	6.84		72-130	30	21-Jul-20 20:32	1	21-Jul-20 20:43	1
PFHxA	307-24-4	0.0411	0.0400	103		0.0395	0.0400	98.7	3.97		72-129	30	21-Jul-20 20:32	1	21-Jul-20 20:43	1
HFPO-DA	13252-13-6	0.0388	0.0400	96.9		0.0379	0.0400	94.8	2.25		70-130	30	21-Jul-20 20:32	1	21-Jul-20 20:43	1
PFHpA	375-85-9	0.0392	0.0400	98.0		0.0390	0.0400	97.6	0.406		72-130	30	21-Jul-20 20:32	1	21-Jul-20 20:43	1
ADONA	919005-14-4	0.0401	0.0400	100		0.0375	0.0400	93.8	6.63		70-130	30	21-Jul-20 20:32	1	21-Jul-20 20:43	1
PFHxS	355-46-4	0.0410	0.0400	103		0.0377	0.0400	94.4	8.33		68-131	30	21-Jul-20 20:32	1	21-Jul-20 20:43	1
PFOA	335-67-1	0.0381	0.0400	95.3		0.0380	0.0400	94.9	0.339		71-133	30	21-Jul-20 20:32	1	21-Jul-20 20:43	1
PFNA	375-95-1	0.0385	0.0400	96.2		0.0370	0.0400	92.6	3.81		69-130	30	21-Jul-20 20:32	1	21-Jul-20 20:43	1
PFOS	1763-23-1	0.0417	0.0400	104		0.0357	0.0400	89.2	15.6		65-140	30	21-Jul-20 20:32	1	21-Jul-20 20:43	1
9Cl-PF3ONS	756426-58-1	0.0383	0.0400	95.7		0.0349	0.0400	87.2	9.39		70-130	30	21-Jul-20 20:32	1	21-Jul-20 20:43	1
PFDA	335-76-2	0.0419	0.0400	105		0.0404	0.0400	101	3.59		71-129	30	21-Jul-20 20:32	1	21-Jul-20 20:43	1
MeFOSAA	2355-31-9	0.0408	0.0400	102		0.0383	0.0400	95.8	6.41		65-136	30	21-Jul-20 20:32	1	21-Jul-20 20:43	1
EtFOSAA	2991-50-6	0.0473	0.0400	118		0.0381	0.0400	95.2	21.5		61-135	30	21-Jul-20 20:32	1	21-Jul-20 20:43	1
PFUnA	2058-94-8	0.0379	0.0400	94.7		0.0388	0.0400	97.1	2.52		69-133	30	21-Jul-20 20:32	1	21-Jul-20 20:43	1
11Cl-PF3OUdS	763051-92-9	0.0402	0.0400	100		0.0382	0.0400	95.4	5.22		70-130	30	21-Jul-20 20:32	1	21-Jul-20 20:43	1
PFDoA	307-55-1	0.0394	0.0400	98.5		0.0376	0.0400	93.9	4.77		72-134	30	21-Jul-20 20:32	1	21-Jul-20 20:43	1
PFTrDA	72629-94-8	0.0412	0.0400	103		0.0407	0.0400	102	1.23		65-144	30	21-Jul-20 20:32	1	21-Jul-20 20:43	1
PFTeDA	376-06-7	0.0409	0.0400	102		0.0377	0.0400	94.3	8.06		71-132	30	21-Jul-20 20:32	1	21-Jul-20 20:43	1

Labeled Standards	Type	LCS % Rec	LCS Quals	LCSD % Rec	LCSD Quals	Limits	LCS Analyzed	LCS Dil	LCSD Analyzed	LCSD Dil
13C3-PFBS	IS	87.5		92.6		50-150	21-Jul-20 20:32	1	21-Jul-20 20:43	1
13C3-HFPO-DA	IS	79.2		83.4		50-150	21-Jul-20 20:32	1	21-Jul-20 20:43	1
13C2-PFHxA	IS	80.7		82.1		50-150	21-Jul-20 20:32	1	21-Jul-20 20:43	1
13C4-PFHpA	IS	83.4		89.0		50-150	21-Jul-20 20:32	1	21-Jul-20 20:43	1
13C3-PFHxS	IS	93.0		104		50-150	21-Jul-20 20:32	1	21-Jul-20 20:43	1
13C5-PFNA	IS	91.4		93.8		50-150	21-Jul-20 20:32	1	21-Jul-20 20:43	1
13C2-PFOA	IS	86.5		89.8		50-150	21-Jul-20 20:32	1	21-Jul-20 20:43	1
13C8-PFOS	IS	83.3		93.2		50-150	21-Jul-20 20:32	1	21-Jul-20 20:43	1
13C2-PFDA	IS	84.0		84.1		50-150	21-Jul-20 20:32	1	21-Jul-20 20:43	1
d3-MeFOSAA	IS	70.9		74.0		50-150	21-Jul-20 20:32	1	21-Jul-20 20:43	1
13C2-PFUnA	IS	73.0		76.5		50-150	21-Jul-20 20:32	1	21-Jul-20 20:43	1
d5-EtFOSAA	IS	65.6		78.9		50-150	21-Jul-20 20:32	1	21-Jul-20 20:43	1
13C2-PFDoA	IS	69.4		76.4		50-150	21-Jul-20 20:32	1	21-Jul-20 20:43	1

Sample ID: LCSD **PFAS Isotope Dilution Table B-15**

Name:	KMEA	Lab Sample:	B0G0090-BS1/B0G0090-BSD1	Date Extracted:	19-Jul-20
Project:	MCAS El Toro and Tustin, PFAS	QC Batch:	B0G0090	Column:	BEH C18
Matrix:	Aqueous	Samp Size:	0.250/0.250 L		

Labeled Standards	Type	LCS % Rec	LCS Quals	LCSD % Rec	LCSD Quals	Limits	LCS Analyzed	LCS Dil	LCSD Analyzed	LCSD Dil
13C2-PFTeDA	IS	71.5		77.9		50-150	21-Jul-20 20:32	1	21-Jul-20 20:43	1

Sample ID: EB07-20200709

PFAS Isotope Dilution Table B-15

Client Data

Name: KMEA
Project: MCAS El Toro and Tustin, PFAS
Matrix: Blank Water
Date Collected: 09-Jul-20 14:00

Laboratory Data

Lab Sample: 2001444-01
Date Received: 10-Jul-20 09:11
Column: BEH C18

Analyte	CAS Number	Conc. (ug/L)	DL	LOD	LOQ	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
PFBS	375-73-5	ND	0.00138	0.00201	0.00402		B0G0090	19-Jul-20	0.249 L	21-Jul-20 20:53	1
PFHxA	307-24-4	ND	0.00138	0.00201	0.00402		B0G0090	19-Jul-20	0.249 L	21-Jul-20 20:53	1
HFPO-DA	13252-13-6	ND	0.00242	0.00301	0.00402		B0G0090	19-Jul-20	0.249 L	21-Jul-20 20:53	1
PFHpA	375-85-9	ND	0.00138	0.00201	0.00402		B0G0090	19-Jul-20	0.249 L	21-Jul-20 20:53	1
ADONA	919005-14-4	ND	0.00138	0.00201	0.00402		B0G0090	19-Jul-20	0.249 L	21-Jul-20 20:53	1
PFHxS	355-46-4	ND	0.00138	0.00201	0.00402		B0G0090	19-Jul-20	0.249 L	21-Jul-20 20:53	1
PFOA	335-67-1	ND	0.00138	0.00201	0.00402		B0G0090	19-Jul-20	0.249 L	21-Jul-20 20:53	1
PFNA	375-95-1	ND	0.00138	0.00201	0.00402		B0G0090	19-Jul-20	0.249 L	21-Jul-20 20:53	1
PFOS	1763-23-1	ND	0.00138	0.00201	0.00402		B0G0090	19-Jul-20	0.249 L	21-Jul-20 20:53	1
9Cl-PF3ONS	756426-58-1	ND	0.00138	0.00201	0.00402		B0G0090	19-Jul-20	0.249 L	21-Jul-20 20:53	1
PFDA	335-76-2	ND	0.00138	0.00201	0.00402		B0G0090	19-Jul-20	0.249 L	21-Jul-20 20:53	1
MeFOSAA	2355-31-9	ND	0.00138	0.00201	0.00402		B0G0090	19-Jul-20	0.249 L	21-Jul-20 20:53	1
EtFOSAA	2991-50-6	ND	0.00138	0.00201	0.00402		B0G0090	19-Jul-20	0.249 L	21-Jul-20 20:53	1
PFUnA	2058-94-8	ND	0.00138	0.00201	0.00402		B0G0090	19-Jul-20	0.249 L	21-Jul-20 20:53	1
11Cl-PF3OUdS	763051-92-9	ND	0.00138	0.00201	0.00402		B0G0090	19-Jul-20	0.249 L	21-Jul-20 20:53	1
PFDoA	307-55-1	ND	0.00138	0.00201	0.00402		B0G0090	19-Jul-20	0.249 L	21-Jul-20 20:53	1
PFTrDA	72629-94-8	ND	0.00138	0.00201	0.00402		B0G0090	19-Jul-20	0.249 L	21-Jul-20 20:53	1
PFTeDA	376-06-7	ND	0.00138	0.00201	0.00402		B0G0090	19-Jul-20	0.249 L	21-Jul-20 20:53	1

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
13C3-PFBS	IS	92.3	50 - 150		B0G0090	19-Jul-20	0.249 L	21-Jul-20 20:53	1
13C3-HFPO-DA	IS	77.7	50 - 150		B0G0090	19-Jul-20	0.249 L	21-Jul-20 20:53	1
13C2-PFHxA	IS	90.7	50 - 150		B0G0090	19-Jul-20	0.249 L	21-Jul-20 20:53	1
13C4-PFHpA	IS	82.3	50 - 150		B0G0090	19-Jul-20	0.249 L	21-Jul-20 20:53	1
13C3-PFHxS	IS	98.5	50 - 150		B0G0090	19-Jul-20	0.249 L	21-Jul-20 20:53	1
13C5-PFNA	IS	98.7	50 - 150		B0G0090	19-Jul-20	0.249 L	21-Jul-20 20:53	1
13C2-PFOA	IS	91.1	50 - 150		B0G0090	19-Jul-20	0.249 L	21-Jul-20 20:53	1
13C8-PFOS	IS	105	50 - 150		B0G0090	19-Jul-20	0.249 L	21-Jul-20 20:53	1
13C2-PFDA	IS	93.8	50 - 150		B0G0090	19-Jul-20	0.249 L	21-Jul-20 20:53	1
d3-MeFOSAA	IS	87.6	50 - 150		B0G0090	19-Jul-20	0.249 L	21-Jul-20 20:53	1
13C2-PFUnA	IS	87.6	50 - 150		B0G0090	19-Jul-20	0.249 L	21-Jul-20 20:53	1
d5-EtFOSAA	IS	89.2	50 - 150		B0G0090	19-Jul-20	0.249 L	21-Jul-20 20:53	1
13C2-PFDoA	IS	86.4	50 - 150		B0G0090	19-Jul-20	0.249 L	21-Jul-20 20:53	1
13C2-PFTeDA	IS	77.8	50 - 150		B0G0090	19-Jul-20	0.249 L	21-Jul-20 20:53	1

DL - Detection Limit
LOD - Limit of Detection
LOQ - Limit of quantitation

Results reported to the DL.

When reported, PFHxS, PFOA, PFOS, MeFOSAA and EtFOSAA include both linear and branched isomers. Only the linear isomer is reported for all other analytes.

Sample ID: TW27S-20200709

PFAS Isotope Dilution Table B-15

Client Data

Name: KMEA
Project: MCAS El Toro and Tustin, PFAS
Matrix: Groundwater
Date Collected: 09-Jul-20 13:00

Laboratory Data

Lab Sample: 2001444-02
Date Received: 10-Jul-20 09:11
Column: BEH C18

Analyte	CAS Number	Conc. (ug/L)	DL	LOD	LOQ	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
PFBS	375-73-5	3.14	0.0207	0.0302	0.0605	D	B0G0090	19-Jul-20	0.248 L	24-Jul-20 20:08	15
PFHxA	307-24-4	10.2	0.0207	0.0302	0.0605	D	B0G0090	19-Jul-20	0.248 L	24-Jul-20 20:08	15
HFPO-DA	13252-13-6	ND	0.00243	0.00302	0.00404		B0G0090	19-Jul-20	0.248 L	21-Jul-20 21:04	1
PFHpA	375-85-9	2.04	0.0207	0.0302	0.0605	D	B0G0090	19-Jul-20	0.248 L	24-Jul-20 20:08	15
ADONA	919005-14-4	ND	0.00138	0.00202	0.00404		B0G0090	19-Jul-20	0.248 L	21-Jul-20 21:04	1
PFHxS	355-46-4	15.7	0.0207	0.0302	0.0605	D	B0G0090	19-Jul-20	0.248 L	24-Jul-20 20:08	15
PFOA	335-67-1	13.2	0.0207	0.0302	0.0605	D	B0G0090	19-Jul-20	0.248 L	24-Jul-20 20:08	15
PFNA	375-95-1	0.100	0.00138	0.00202	0.00404		B0G0090	19-Jul-20	0.248 L	21-Jul-20 21:04	1
PFOS	1763-23-1	12.2	0.0207	0.0302	0.0605	D	B0G0090	19-Jul-20	0.248 L	24-Jul-20 20:08	15
9Cl-PF3ONS	756426-58-1	ND	0.00138	0.00202	0.00404		B0G0090	19-Jul-20	0.248 L	21-Jul-20 21:04	1
PFDA	335-76-2	0.0167	0.00138	0.00202	0.00404		B0G0090	19-Jul-20	0.248 L	21-Jul-20 21:04	1
MeFOSAA	2355-31-9	ND	0.00138	0.00202	0.00404		B0G0090	19-Jul-20	0.248 L	21-Jul-20 21:04	1
EtFOSAA	2991-50-6	ND	0.00138	0.00202	0.00404		B0G0090	19-Jul-20	0.248 L	21-Jul-20 21:04	1
PFUnA	2058-94-8	ND	0.00138	0.00202	0.00404		B0G0090	19-Jul-20	0.248 L	21-Jul-20 21:04	1
11Cl-PF3OUdS	763051-92-9	ND	0.00138	0.00202	0.00404		B0G0090	19-Jul-20	0.248 L	21-Jul-20 21:04	1
PFDoA	307-55-1	ND	0.00138	0.00202	0.00404		B0G0090	19-Jul-20	0.248 L	21-Jul-20 21:04	1
PFTrDA	72629-94-8	ND	0.00138	0.00202	0.00404		B0G0090	19-Jul-20	0.248 L	21-Jul-20 21:04	1
PFTeDA	376-06-7	ND	0.00138	0.00202	0.00404		B0G0090	19-Jul-20	0.248 L	21-Jul-20 21:04	1

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
13C3-PFBS	IS	72.0	50 - 150	D	B0G0090	19-Jul-20	0.248 L	24-Jul-20 20:08	15
13C3-HFPO-DA	IS	83.1	50 - 150		B0G0090	19-Jul-20	0.248 L	21-Jul-20 21:04	1
13C2-PFHxA	IS	101	50 - 150	D	B0G0090	19-Jul-20	0.248 L	24-Jul-20 20:08	15
13C4-PFHpA	IS	101	50 - 150	D	B0G0090	19-Jul-20	0.248 L	24-Jul-20 20:08	15
13C3-PFHxS	IS	84.0	50 - 150	D	B0G0090	19-Jul-20	0.248 L	24-Jul-20 20:08	15
13C5-PFNA	IS	83.1	50 - 150		B0G0090	19-Jul-20	0.248 L	21-Jul-20 21:04	1
13C2-PFOA	IS	107	50 - 150	D	B0G0090	19-Jul-20	0.248 L	24-Jul-20 20:08	15
13C8-PFOS	IS	94.5	50 - 150	D	B0G0090	19-Jul-20	0.248 L	24-Jul-20 20:08	15
13C2-PFDA	IS	91.5	50 - 150		B0G0090	19-Jul-20	0.248 L	21-Jul-20 21:04	1
d3-MeFOSAA	IS	79.3	50 - 150		B0G0090	19-Jul-20	0.248 L	21-Jul-20 21:04	1
13C2-PFUnA	IS	83.0	50 - 150		B0G0090	19-Jul-20	0.248 L	21-Jul-20 21:04	1
d5-EtFOSAA	IS	86.8	50 - 150		B0G0090	19-Jul-20	0.248 L	21-Jul-20 21:04	1
13C2-PFDoA	IS	78.6	50 - 150		B0G0090	19-Jul-20	0.248 L	21-Jul-20 21:04	1
13C2-PFTeDA	IS	60.7	50 - 150		B0G0090	19-Jul-20	0.248 L	21-Jul-20 21:04	1

DL - Detection Limit
LOD - Limit of Detection
LOQ - Limit of quantitation

Results reported to the DL.

When reported, PFHxS, PFOA, PFOS, MeFOSAA and EtFOSAA include both linear and branched isomers. Only the linear isomer is reported for all other analytes.

Sample ID: TW22S-20200709 **PFAS Isotope Dilution Table B-15**

Client Data

Name: KMEA
Project: MCAS El Toro and Tustin, PFAS
Matrix: Groundwater
Date Collected: 09-Jul-20 14:00

Laboratory Data

Lab Sample: 2001444-03
Date Received: 10-Jul-20 09:11
Column: BEH C18

Analyte	CAS Number	Conc. (ug/L)	DL	LOD	LOQ	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
PFBS	375-73-5	0.275	0.00132	0.00193	0.00386		B0G0090	19-Jul-20	0.259 L	23-Jul-20 12:57	1
PFHxA	307-24-4	1.34	0.00132	0.00193	0.00386		B0G0090	19-Jul-20	0.259 L	23-Jul-20 12:57	1
HFPO-DA	13252-13-6	ND	0.00233	0.00290	0.00386		B0G0090	19-Jul-20	0.259 L	23-Jul-20 12:57	1
PFHpA	375-85-9	0.492	0.00132	0.00193	0.00386		B0G0090	19-Jul-20	0.259 L	23-Jul-20 12:57	1
ADONA	919005-14-4	ND	0.00132	0.00193	0.00386		B0G0090	19-Jul-20	0.259 L	23-Jul-20 12:57	1
PFHxS	355-46-4	1.26	0.00132	0.00193	0.00386		B0G0090	19-Jul-20	0.259 L	23-Jul-20 12:57	1
PFOA	335-67-1	1.42	0.00132	0.00193	0.00386		B0G0090	19-Jul-20	0.259 L	23-Jul-20 12:57	1
PFNA	375-95-1	0.00857	0.00132	0.00193	0.00386		B0G0090	19-Jul-20	0.259 L	23-Jul-20 12:57	1
PFOS	1763-23-1	0.736	0.00132	0.00193	0.00386		B0G0090	19-Jul-20	0.259 L	23-Jul-20 12:57	1
9Cl-PF3ONS	756426-58-1	ND	0.00132	0.00193	0.00386		B0G0090	19-Jul-20	0.259 L	23-Jul-20 12:57	1
PFDA	335-76-2	ND	0.00132	0.00193	0.00386		B0G0090	19-Jul-20	0.259 L	23-Jul-20 12:57	1
MeFOSAA	2355-31-9	ND	0.00132	0.00193	0.00386		B0G0090	19-Jul-20	0.259 L	23-Jul-20 12:57	1
EtFOSAA	2991-50-6	ND	0.00132	0.00193	0.00386		B0G0090	19-Jul-20	0.259 L	23-Jul-20 12:57	1
PFUnA	2058-94-8	ND	0.00132	0.00193	0.00386		B0G0090	19-Jul-20	0.259 L	23-Jul-20 12:57	1
11Cl-PF3OUdS	763051-92-9	ND	0.00132	0.00193	0.00386		B0G0090	19-Jul-20	0.259 L	23-Jul-20 12:57	1
PFDoA	307-55-1	ND	0.00132	0.00193	0.00386		B0G0090	19-Jul-20	0.259 L	23-Jul-20 12:57	1
PFTrDA	72629-94-8	ND	0.00132	0.00193	0.00386		B0G0090	19-Jul-20	0.259 L	23-Jul-20 12:57	1
PFTeDA	376-06-7	ND	0.00132	0.00193	0.00386		B0G0090	19-Jul-20	0.259 L	23-Jul-20 12:57	1

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
13C3-PFBS	IS	90.4	50 - 150		B0G0090	19-Jul-20	0.259 L	23-Jul-20 12:57	1
13C3-HFPO-DA	IS	82.3	50 - 150		B0G0090	19-Jul-20	0.259 L	23-Jul-20 12:57	1
13C2-PFHxA	IS	79.4	50 - 150		B0G0090	19-Jul-20	0.259 L	23-Jul-20 12:57	1
13C4-PFHpA	IS	87.2	50 - 150		B0G0090	19-Jul-20	0.259 L	23-Jul-20 12:57	1
13C3-PFHxS	IS	82.3	50 - 150		B0G0090	19-Jul-20	0.259 L	23-Jul-20 12:57	1
13C5-PFNA	IS	87.9	50 - 150		B0G0090	19-Jul-20	0.259 L	23-Jul-20 12:57	1
13C2-PFOA	IS	87.8	50 - 150		B0G0090	19-Jul-20	0.259 L	23-Jul-20 12:57	1
13C8-PFOS	IS	84.0	50 - 150		B0G0090	19-Jul-20	0.259 L	23-Jul-20 12:57	1
13C2-PFDA	IS	83.0	50 - 150		B0G0090	19-Jul-20	0.259 L	23-Jul-20 12:57	1
d3-MeFOSAA	IS	90.2	50 - 150		B0G0090	19-Jul-20	0.259 L	23-Jul-20 12:57	1
13C2-PFUnA	IS	84.7	50 - 150		B0G0090	19-Jul-20	0.259 L	23-Jul-20 12:57	1
d5-EtFOSAA	IS	75.2	50 - 150		B0G0090	19-Jul-20	0.259 L	23-Jul-20 12:57	1
13C2-PFDoA	IS	74.5	50 - 150		B0G0090	19-Jul-20	0.259 L	23-Jul-20 12:57	1
13C2-PFTeDA	IS	67.5	50 - 150		B0G0090	19-Jul-20	0.259 L	23-Jul-20 12:57	1

DL - Detection Limit
LOD - Limit of Detection
LOQ - Limit of quantitation

Results reported to the DL.

When reported, PFHxS, PFOA, PFOS, MeFOSAA and EtFOSAA include both linear and branched isomers. Only the linear isomer is reported for all other analytes.

Vista Analytical Laboratory

Sample ID: TW10D-20200709

PFAS Isotope Dilution Table B-15

Client Data

Name: KMEA
Project: MCAS El Toro and Tustin, PFAS
Matrix: Groundwater
Date Collected: 09-Jul-20 08:20

Laboratory Data

Lab Sample: 2001444-04
Date Received: 10-Jul-20 09:11
Column: BEH C18

Analyte	CAS Number	Conc. (ug/L)	DL	LOD	LOQ	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
PFBS	375-73-5	0.101	0.00122	0.00178	0.00356		B0G0090	19-Jul-20	0.281 L	21-Jul-20 21:25	1
PFHxA	307-24-4	0.224	0.00122	0.00178	0.00356		B0G0090	19-Jul-20	0.281 L	21-Jul-20 21:25	1
HFPO-DA	13252-13-6	ND	0.00215	0.00267	0.00356		B0G0090	19-Jul-20	0.281 L	21-Jul-20 21:25	1
PFHpA	375-85-9	0.0956	0.00122	0.00178	0.00356		B0G0090	19-Jul-20	0.281 L	21-Jul-20 21:25	1
ADONA	919005-14-4	ND	0.00122	0.00178	0.00356		B0G0090	19-Jul-20	0.281 L	21-Jul-20 21:25	1
PFHxS	355-46-4	0.664	0.00122	0.00178	0.00356		B0G0090	19-Jul-20	0.281 L	21-Jul-20 21:25	1
PFOA	335-67-1	0.854	0.00122	0.00178	0.00356		B0G0090	19-Jul-20	0.281 L	21-Jul-20 21:25	1
PFNA	375-95-1	0.00322	0.00122	0.00178	0.00356	J	B0G0090	19-Jul-20	0.281 L	21-Jul-20 21:25	1
PFOS	1763-23-1	0.531	0.00122	0.00178	0.00356		B0G0090	19-Jul-20	0.281 L	21-Jul-20 21:25	1
9Cl-PF3ONS	756426-58-1	ND	0.00122	0.00178	0.00356		B0G0090	19-Jul-20	0.281 L	21-Jul-20 21:25	1
PFDA	335-76-2	ND	0.00122	0.00178	0.00356		B0G0090	19-Jul-20	0.281 L	21-Jul-20 21:25	1
MeFOSAA	2355-31-9	ND	0.00122	0.00178	0.00356		B0G0090	19-Jul-20	0.281 L	21-Jul-20 21:25	1
EtFOSAA	2991-50-6	ND	0.00122	0.00178	0.00356		B0G0090	19-Jul-20	0.281 L	21-Jul-20 21:25	1
PFUnA	2058-94-8	ND	0.00122	0.00178	0.00356		B0G0090	19-Jul-20	0.281 L	21-Jul-20 21:25	1
11Cl-PF3OUdS	763051-92-9	ND	0.00122	0.00178	0.00356		B0G0090	19-Jul-20	0.281 L	21-Jul-20 21:25	1
PFDoA	307-55-1	ND	0.00122	0.00178	0.00356		B0G0090	19-Jul-20	0.281 L	21-Jul-20 21:25	1
PFTrDA	72629-94-8	ND	0.00122	0.00178	0.00356		B0G0090	19-Jul-20	0.281 L	21-Jul-20 21:25	1
PFTeDA	376-06-7	ND	0.00122	0.00178	0.00356		B0G0090	19-Jul-20	0.281 L	21-Jul-20 21:25	1

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
13C3-PFBS	IS	85.6	50 - 150		B0G0090	19-Jul-20	0.281 L	21-Jul-20 21:25	1
13C3-HFPO-DA	IS	79.4	50 - 150		B0G0090	19-Jul-20	0.281 L	21-Jul-20 21:25	1
13C2-PFHxA	IS	78.9	50 - 150		B0G0090	19-Jul-20	0.281 L	21-Jul-20 21:25	1
13C4-PFHpA	IS	75.9	50 - 150		B0G0090	19-Jul-20	0.281 L	21-Jul-20 21:25	1
13C3-PFHxS	IS	84.2	50 - 150		B0G0090	19-Jul-20	0.281 L	21-Jul-20 21:25	1
13C5-PFNA	IS	81.8	50 - 150		B0G0090	19-Jul-20	0.281 L	21-Jul-20 21:25	1
13C2-PFOA	IS	82.9	50 - 150		B0G0090	19-Jul-20	0.281 L	21-Jul-20 21:25	1
13C8-PFOS	IS	76.8	50 - 150		B0G0090	19-Jul-20	0.281 L	21-Jul-20 21:25	1
13C2-PFDA	IS	78.0	50 - 150		B0G0090	19-Jul-20	0.281 L	21-Jul-20 21:25	1
d3-MeFOSAA	IS	63.2	50 - 150		B0G0090	19-Jul-20	0.281 L	21-Jul-20 21:25	1
13C2-PFUnA	IS	63.2	50 - 150		B0G0090	19-Jul-20	0.281 L	21-Jul-20 21:25	1
d5-EtFOSAA	IS	66.1	50 - 150		B0G0090	19-Jul-20	0.281 L	21-Jul-20 21:25	1
13C2-PFDoA	IS	52.7	50 - 150		B0G0090	19-Jul-20	0.281 L	21-Jul-20 21:25	1
13C2-PFTeDA	IS	14.5	50 - 150	H	B0G0090	19-Jul-20	0.281 L	21-Jul-20 21:25	1

DL - Detection Limit
LOD - Limit of Detection
LOQ - Limit of quantitation

Results reported to the DL.

When reported, PFHxS, PFOA, PFOS, MeFOSAA and EtFOSAA include both linear and branched isomers. Only the linear isomer is reported for all other analytes.

Vista Analytical Laboratory

Sample ID: TW11D-20200709

PFAS Isotope Dilution Table B-15

Client Data

Name: KMEA
Project: MCAS El Toro and Tustin, PFAS
Matrix: Groundwater
Date Collected: 09-Jul-20 10:25

Laboratory Data

Lab Sample: 2001444-05
Date Received: 10-Jul-20 09:11
Column: BEH C18

Analyte	CAS Number	Conc. (ug/L)	DL	LOD	LOQ	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
PFBS	375-73-5	0.0407	0.000903	0.00132	0.00264		B0G0090	19-Jul-20	0.379 L	21-Jul-20 22:07	1
PFHxA	307-24-4	0.109	0.000903	0.00132	0.00264		B0G0090	19-Jul-20	0.379 L	21-Jul-20 22:07	1
HFPO-DA	13252-13-6	ND	0.00159	0.00198	0.00264		B0G0090	19-Jul-20	0.379 L	21-Jul-20 22:07	1
PFHpA	375-85-9	0.0377	0.000903	0.00132	0.00264		B0G0090	19-Jul-20	0.379 L	21-Jul-20 22:07	1
ADONA	919005-14-4	ND	0.000903	0.00132	0.00264		B0G0090	19-Jul-20	0.379 L	21-Jul-20 22:07	1
PFHxS	355-46-4	0.233	0.000903	0.00132	0.00264		B0G0090	19-Jul-20	0.379 L	21-Jul-20 22:07	1
PFOA	335-67-1	0.184	0.000903	0.00132	0.00264		B0G0090	19-Jul-20	0.379 L	21-Jul-20 22:07	1
PFNA	375-95-1	0.00164	0.000903	0.00132	0.00264	J	B0G0090	19-Jul-20	0.379 L	21-Jul-20 22:07	1
PFOS	1763-23-1	0.305	0.000903	0.00132	0.00264		B0G0090	19-Jul-20	0.379 L	21-Jul-20 22:07	1
9Cl-PF3ONS	756426-58-1	ND	0.000903	0.00132	0.00264		B0G0090	19-Jul-20	0.379 L	21-Jul-20 22:07	1
PFDA	335-76-2	ND	0.000903	0.00132	0.00264		B0G0090	19-Jul-20	0.379 L	21-Jul-20 22:07	1
MeFOSAA	2355-31-9	ND	0.000903	0.00132	0.00264		B0G0090	19-Jul-20	0.379 L	21-Jul-20 22:07	1
EtFOSAA	2991-50-6	ND	0.000903	0.00132	0.00264		B0G0090	19-Jul-20	0.379 L	21-Jul-20 22:07	1
PFUnA	2058-94-8	ND	0.000903	0.00132	0.00264		B0G0090	19-Jul-20	0.379 L	21-Jul-20 22:07	1
11Cl-PF3OUdS	763051-92-9	ND	0.000903	0.00132	0.00264		B0G0090	19-Jul-20	0.379 L	21-Jul-20 22:07	1
PFDoA	307-55-1	ND	0.000903	0.00132	0.00264		B0G0090	19-Jul-20	0.379 L	21-Jul-20 22:07	1
PFTrDA	72629-94-8	ND	0.000903	0.00132	0.00264		B0G0090	19-Jul-20	0.379 L	21-Jul-20 22:07	1
PFTeDA	376-06-7	ND	0.000903	0.00132	0.00264		B0G0090	19-Jul-20	0.379 L	21-Jul-20 22:07	1

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
13C3-PFBS	IS	70.6	50 - 150		B0G0090	19-Jul-20	0.379 L	21-Jul-20 22:07	1
13C3-HFPO-DA	IS	57.5	50 - 150		B0G0090	19-Jul-20	0.379 L	21-Jul-20 22:07	1
13C2-PFHxA	IS	63.1	50 - 150		B0G0090	19-Jul-20	0.379 L	21-Jul-20 22:07	1
13C4-PFHpA	IS	62.4	50 - 150		B0G0090	19-Jul-20	0.379 L	21-Jul-20 22:07	1
13C3-PFHxS	IS	68.4	50 - 150		B0G0090	19-Jul-20	0.379 L	21-Jul-20 22:07	1
13C5-PFNA	IS	68.6	50 - 150		B0G0090	19-Jul-20	0.379 L	21-Jul-20 22:07	1
13C2-PFOA	IS	62.9	50 - 150		B0G0090	19-Jul-20	0.379 L	21-Jul-20 22:07	1
13C8-PFOS	IS	64.2	50 - 150		B0G0090	19-Jul-20	0.379 L	21-Jul-20 22:07	1
13C2-PFDA	IS	59.8	50 - 150		B0G0090	19-Jul-20	0.379 L	21-Jul-20 22:07	1
d3-MeFOSAA	IS	40.0	50 - 150	H	B0G0090	19-Jul-20	0.379 L	21-Jul-20 22:07	1
13C2-PFUnA	IS	43.6	50 - 150	H	B0G0090	19-Jul-20	0.379 L	21-Jul-20 22:07	1
d5-EtFOSAA	IS	42.9	50 - 150	H	B0G0090	19-Jul-20	0.379 L	21-Jul-20 22:07	1
13C2-PFDoA	IS	27.5	50 - 150	H	B0G0090	19-Jul-20	0.379 L	21-Jul-20 22:07	1
13C2-PFTeDA	IS	6.00	50 - 150	H	B0G0090	19-Jul-20	0.379 L	21-Jul-20 22:07	1

DL - Detection Limit
LOD - Limit of Detection
LOQ - Limit of quantitation

Results reported to the DL.

When reported, PFHxS, PFOA, PFOS, MeFOSAA and EtFOSAA include both linear and branched isomers. Only the linear isomer is reported for all other analytes.

Sample ID: TW12D-20200709 **PFAS Isotope Dilution Table B-15**

Client Data

Name: KMEA
Project: MCAS El Toro and Tustin, PFAS
Matrix: Groundwater
Date Collected: 09-Jul-20 12:15

Laboratory Data

Lab Sample: 2001444-06
Date Received: 10-Jul-20 09:11
Column: BEH C18

Analyte	CAS Number	Conc. (ug/L)	DL	LOD	LOQ	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
PFBS	375-73-5	0.0982	0.000970	0.00142	0.00283		B0G0090	19-Jul-20	0.353 L	21-Jul-20 22:18	1
PFHxA	307-24-4	0.664	0.000970	0.00142	0.00283		B0G0090	19-Jul-20	0.353 L	21-Jul-20 22:18	1
HFPO-DA	13252-13-6	ND	0.00171	0.00212	0.00283		B0G0090	19-Jul-20	0.353 L	21-Jul-20 22:18	1
PFHpA	375-85-9	0.315	0.000970	0.00142	0.00283		B0G0090	19-Jul-20	0.353 L	21-Jul-20 22:18	1
ADONA	919005-14-4	ND	0.000970	0.00142	0.00283		B0G0090	19-Jul-20	0.353 L	21-Jul-20 22:18	1
PFHxS	355-46-4	0.435	0.000970	0.00142	0.00283		B0G0090	19-Jul-20	0.353 L	21-Jul-20 22:18	1
PFOA	335-67-1	0.570	0.000970	0.00142	0.00283		B0G0090	19-Jul-20	0.353 L	21-Jul-20 22:18	1
PFNA	375-95-1	0.00396	0.000970	0.00142	0.00283		B0G0090	19-Jul-20	0.353 L	21-Jul-20 22:18	1
PFOS	1763-23-1	0.198	0.000970	0.00142	0.00283		B0G0090	19-Jul-20	0.353 L	21-Jul-20 22:18	1
9Cl-PF3ONS	756426-58-1	ND	0.000970	0.00142	0.00283		B0G0090	19-Jul-20	0.353 L	21-Jul-20 22:18	1
PFDA	335-76-2	ND	0.000970	0.00142	0.00283		B0G0090	19-Jul-20	0.353 L	21-Jul-20 22:18	1
MeFOSAA	2355-31-9	ND	0.000970	0.00142	0.00283		B0G0090	19-Jul-20	0.353 L	21-Jul-20 22:18	1
EtFOSAA	2991-50-6	ND	0.000970	0.00142	0.00283		B0G0090	19-Jul-20	0.353 L	21-Jul-20 22:18	1
PFUnA	2058-94-8	ND	0.000970	0.00142	0.00283		B0G0090	19-Jul-20	0.353 L	21-Jul-20 22:18	1
11Cl-PF3OUdS	763051-92-9	ND	0.000970	0.00142	0.00283		B0G0090	19-Jul-20	0.353 L	21-Jul-20 22:18	1
PFDoA	307-55-1	ND	0.000970	0.00142	0.00283		B0G0090	19-Jul-20	0.353 L	21-Jul-20 22:18	1
PFTrDA	72629-94-8	ND	0.000970	0.00142	0.00283		B0G0090	19-Jul-20	0.353 L	21-Jul-20 22:18	1
PFTeDA	376-06-7	ND	0.000970	0.00142	0.00283		B0G0090	19-Jul-20	0.353 L	21-Jul-20 22:18	1

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
13C3-PFBS	IS	68.4	50 - 150		B0G0090	19-Jul-20	0.353 L	21-Jul-20 22:18	1
13C3-HFPO-DA	IS	59.6	50 - 150		B0G0090	19-Jul-20	0.353 L	21-Jul-20 22:18	1
13C2-PFHxA	IS	62.5	50 - 150		B0G0090	19-Jul-20	0.353 L	21-Jul-20 22:18	1
13C4-PFHpA	IS	62.3	50 - 150		B0G0090	19-Jul-20	0.353 L	21-Jul-20 22:18	1
13C3-PFHxS	IS	69.4	50 - 150		B0G0090	19-Jul-20	0.353 L	21-Jul-20 22:18	1
13C5-PFNA	IS	67.8	50 - 150		B0G0090	19-Jul-20	0.353 L	21-Jul-20 22:18	1
13C2-PFOA	IS	68.5	50 - 150		B0G0090	19-Jul-20	0.353 L	21-Jul-20 22:18	1
13C8-PFOS	IS	66.2	50 - 150		B0G0090	19-Jul-20	0.353 L	21-Jul-20 22:18	1
13C2-PFDA	IS	65.8	50 - 150		B0G0090	19-Jul-20	0.353 L	21-Jul-20 22:18	1
d3-MeFOSAA	IS	44.9	50 - 150	H	B0G0090	19-Jul-20	0.353 L	21-Jul-20 22:18	1
13C2-PFUnA	IS	42.9	50 - 150	H	B0G0090	19-Jul-20	0.353 L	21-Jul-20 22:18	1
d5-EtFOSAA	IS	41.2	50 - 150	H	B0G0090	19-Jul-20	0.353 L	21-Jul-20 22:18	1
13C2-PFDoA	IS	24.1	50 - 150	H	B0G0090	19-Jul-20	0.353 L	21-Jul-20 22:18	1
13C2-PFTeDA	IS	5.20	50 - 150	H	B0G0090	19-Jul-20	0.353 L	21-Jul-20 22:18	1

DL - Detection Limit
LOD - Limit of Detection
LOQ - Limit of quantitation

Results reported to the DL.

When reported, PFHxS, PFOA, PFOS, MeFOSAA and EtFOSAA include both linear and branched isomers. Only the linear isomer is reported for all other analytes.

Sample ID: TW13D-20200709

PFAS Isotope Dilution Table B-15

Client Data

Name: KMEA
Project: MCAS El Toro and Tustin, PFAS
Matrix: Groundwater
Date Collected: 09-Jul-20 14:00

Laboratory Data

Lab Sample: 2001444-07
Date Received: 10-Jul-20 09:11
Column: BEH C18

Analyte	CAS Number	Conc. (ug/L)	DL	LOD	LOQ	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
PFBS	375-73-5	0.290	0.00130	0.00190	0.00380		B0G0090	19-Jul-20	0.263 L	21-Jul-20 22:29	1
PFHxA	307-24-4	1.26	0.00130	0.00190	0.00380		B0G0090	19-Jul-20	0.263 L	21-Jul-20 22:29	1
HFPO-DA	13252-13-6	ND	0.00229	0.00285	0.00380		B0G0090	19-Jul-20	0.263 L	21-Jul-20 22:29	1
PFHpA	375-85-9	0.254	0.00130	0.00190	0.00380		B0G0090	19-Jul-20	0.263 L	21-Jul-20 22:29	1
ADONA	919005-14-4	ND	0.00130	0.00190	0.00380		B0G0090	19-Jul-20	0.263 L	21-Jul-20 22:29	1
PFHxS	355-46-4	1.47	0.00130	0.00190	0.00380		B0G0090	19-Jul-20	0.263 L	21-Jul-20 22:29	1
PFOA	335-67-1	4.22	0.00651	0.00951	0.0190	D	B0G0090	19-Jul-20	0.263 L	24-Jul-20 20:19	5
PFNA	375-95-1	0.00245	0.00130	0.00190	0.00380	J, Q	B0G0090	19-Jul-20	0.263 L	21-Jul-20 22:29	1
PFOS	1763-23-1	0.231	0.00130	0.00190	0.00380		B0G0090	19-Jul-20	0.263 L	21-Jul-20 22:29	1
9Cl-PF3ONS	756426-58-1	ND	0.00130	0.00190	0.00380		B0G0090	19-Jul-20	0.263 L	21-Jul-20 22:29	1
PFDA	335-76-2	ND	0.00130	0.00190	0.00380		B0G0090	19-Jul-20	0.263 L	21-Jul-20 22:29	1
MeFOSAA	2355-31-9	ND	0.00130	0.00190	0.00380		B0G0090	19-Jul-20	0.263 L	21-Jul-20 22:29	1
EtFOSAA	2991-50-6	ND	0.00130	0.00190	0.00380		B0G0090	19-Jul-20	0.263 L	21-Jul-20 22:29	1
PFUnA	2058-94-8	ND	0.00130	0.00190	0.00380		B0G0090	19-Jul-20	0.263 L	21-Jul-20 22:29	1
11Cl-PF3OUdS	763051-92-9	ND	0.00130	0.00190	0.00380		B0G0090	19-Jul-20	0.263 L	21-Jul-20 22:29	1
PFDoA	307-55-1	ND	0.00130	0.00190	0.00380		B0G0090	19-Jul-20	0.263 L	21-Jul-20 22:29	1
PFTrDA	72629-94-8	ND	0.00130	0.00190	0.00380		B0G0090	19-Jul-20	0.263 L	21-Jul-20 22:29	1
PFTeDA	376-06-7	ND	0.00130	0.00190	0.00380		B0G0090	19-Jul-20	0.263 L	21-Jul-20 22:29	1

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
13C3-PFBS	IS	84.5	50 - 150		B0G0090	19-Jul-20	0.263 L	21-Jul-20 22:29	1
13C3-HFPO-DA	IS	83.5	50 - 150		B0G0090	19-Jul-20	0.263 L	21-Jul-20 22:29	1
13C2-PFHxA	IS	83.0	50 - 150		B0G0090	19-Jul-20	0.263 L	21-Jul-20 22:29	1
13C4-PFHpA	IS	84.7	50 - 150		B0G0090	19-Jul-20	0.263 L	21-Jul-20 22:29	1
13C3-PFHxS	IS	84.3	50 - 150		B0G0090	19-Jul-20	0.263 L	21-Jul-20 22:29	1
13C5-PFNA	IS	88.2	50 - 150		B0G0090	19-Jul-20	0.263 L	21-Jul-20 22:29	1
13C2-PFOA	IS	100	50 - 150	D	B0G0090	19-Jul-20	0.263 L	24-Jul-20 20:19	5
13C8-PFOS	IS	92.8	50 - 150		B0G0090	19-Jul-20	0.263 L	21-Jul-20 22:29	1
13C2-PFDA	IS	88.3	50 - 150		B0G0090	19-Jul-20	0.263 L	21-Jul-20 22:29	1
d3-MeFOSAA	IS	75.1	50 - 150		B0G0090	19-Jul-20	0.263 L	21-Jul-20 22:29	1
13C2-PFUnA	IS	73.0	50 - 150		B0G0090	19-Jul-20	0.263 L	21-Jul-20 22:29	1
d5-EtFOSAA	IS	70.7	50 - 150		B0G0090	19-Jul-20	0.263 L	21-Jul-20 22:29	1
13C2-PFDoA	IS	52.4	50 - 150		B0G0090	19-Jul-20	0.263 L	21-Jul-20 22:29	1
13C2-PFTeDA	IS	10.8	50 - 150	H	B0G0090	19-Jul-20	0.263 L	21-Jul-20 22:29	1

DL - Detection Limit
LOD - Limit of Detection
LOQ - Limit of quantitation

Results reported to the DL.

When reported, PFHxS, PFOA, PFOS, MeFOSAA and EtFOSAA include both linear and branched isomers. Only the linear isomer is reported for all other analytes.

Sample ID: TW14D-20200709

PFAS Isotope Dilution Table B-15

Client Data

Name: KMEA
Project: MCAS El Toro and Tustin, PFAS
Matrix: Groundwater
Date Collected: 09-Jul-20 15:30

Laboratory Data

Lab Sample: 2001444-08
Date Received: 10-Jul-20 09:11
Column: BEH C18

Analyte	CAS Number	Conc. (ug/L)	DL	LOD	LOQ	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
PFBS	375-73-5	0.0328	0.00133	0.00194	0.00388		B0G0090	19-Jul-20	0.258 L	23-Jul-20 13:08	1
PFHxA	307-24-4	0.0845	0.00133	0.00194	0.00388		B0G0090	19-Jul-20	0.258 L	23-Jul-20 13:08	1
HFPO-DA	13252-13-6	ND	0.00234	0.00291	0.00388		B0G0090	19-Jul-20	0.258 L	23-Jul-20 13:08	1
PFHpA	375-85-9	0.0313	0.00133	0.00194	0.00388		B0G0090	19-Jul-20	0.258 L	23-Jul-20 13:08	1
ADONA	919005-14-4	ND	0.00133	0.00194	0.00388		B0G0090	19-Jul-20	0.258 L	23-Jul-20 13:08	1
PFHxS	355-46-4	0.153	0.00133	0.00194	0.00388		B0G0090	19-Jul-20	0.258 L	23-Jul-20 13:08	1
PFOA	335-67-1	0.250	0.00133	0.00194	0.00388		B0G0090	19-Jul-20	0.258 L	23-Jul-20 13:08	1
PFNA	375-95-1	ND	0.00133	0.00194	0.00388		B0G0090	19-Jul-20	0.258 L	23-Jul-20 13:08	1
PFOS	1763-23-1	0.0233	0.00133	0.00194	0.00388		B0G0090	19-Jul-20	0.258 L	23-Jul-20 13:08	1
9Cl-PF3ONS	756426-58-1	ND	0.00133	0.00194	0.00388		B0G0090	19-Jul-20	0.258 L	23-Jul-20 13:08	1
PFDA	335-76-2	ND	0.00133	0.00194	0.00388		B0G0090	19-Jul-20	0.258 L	23-Jul-20 13:08	1
MeFOSAA	2355-31-9	ND	0.00133	0.00194	0.00388		B0G0090	19-Jul-20	0.258 L	23-Jul-20 13:08	1
EtFOSAA	2991-50-6	ND	0.00133	0.00194	0.00388		B0G0090	19-Jul-20	0.258 L	23-Jul-20 13:08	1
PFUnA	2058-94-8	ND	0.00133	0.00194	0.00388		B0G0090	19-Jul-20	0.258 L	23-Jul-20 13:08	1
11Cl-PF3OUdS	763051-92-9	ND	0.00133	0.00194	0.00388		B0G0090	19-Jul-20	0.258 L	23-Jul-20 13:08	1
PFDoA	307-55-1	ND	0.00133	0.00194	0.00388		B0G0090	19-Jul-20	0.258 L	23-Jul-20 13:08	1
PFTrDA	72629-94-8	ND	0.00133	0.00194	0.00388		B0G0090	19-Jul-20	0.258 L	23-Jul-20 13:08	1
PFTeDA	376-06-7	ND	0.00133	0.00194	0.00388		B0G0090	19-Jul-20	0.258 L	23-Jul-20 13:08	1

Labeled Standards	Type	% Recovery	Limits	Qualifiers	Batch	Extracted	Samp Size	Analyzed	Dilution
13C3-PFBS	IS	89.7	50 - 150		B0G0090	19-Jul-20	0.258 L	23-Jul-20 13:08	1
13C3-HFPO-DA	IS	76.1	50 - 150		B0G0090	19-Jul-20	0.258 L	23-Jul-20 13:08	1
13C2-PFHxA	IS	79.0	50 - 150		B0G0090	19-Jul-20	0.258 L	23-Jul-20 13:08	1
13C4-PFHpA	IS	83.8	50 - 150		B0G0090	19-Jul-20	0.258 L	23-Jul-20 13:08	1
13C3-PFHxS	IS	86.0	50 - 150		B0G0090	19-Jul-20	0.258 L	23-Jul-20 13:08	1
13C5-PFNA	IS	87.1	50 - 150		B0G0090	19-Jul-20	0.258 L	23-Jul-20 13:08	1
13C2-PFOA	IS	88.9	50 - 150		B0G0090	19-Jul-20	0.258 L	23-Jul-20 13:08	1
13C8-PFOS	IS	74.9	50 - 150		B0G0090	19-Jul-20	0.258 L	23-Jul-20 13:08	1
13C2-PFDA	IS	81.0	50 - 150		B0G0090	19-Jul-20	0.258 L	23-Jul-20 13:08	1
d3-MeFOSAA	IS	78.6	50 - 150		B0G0090	19-Jul-20	0.258 L	23-Jul-20 13:08	1
13C2-PFUnA	IS	69.1	50 - 150		B0G0090	19-Jul-20	0.258 L	23-Jul-20 13:08	1
d5-EtFOSAA	IS	60.1	50 - 150		B0G0090	19-Jul-20	0.258 L	23-Jul-20 13:08	1
13C2-PFDoA	IS	41.5	50 - 150	H	B0G0090	19-Jul-20	0.258 L	23-Jul-20 13:08	1
13C2-PFTeDA	IS	6.60	50 - 150	H	B0G0090	19-Jul-20	0.258 L	23-Jul-20 13:08	1

DL - Detection Limit
LOD - Limit of Detection
LOQ - Limit of quantitation

Results reported to the DL.

When reported, PFHxS, PFOA, PFOS, MeFOSAA and EtFOSAA include both linear and branched isomers. Only the linear isomer is reported for all other analytes.

DATA QUALIFIERS & ABBREVIATIONS

B	This compound was also detected in the method blank
Conc.	Concentration
CRS	Cleanup Recovery Standard
D	Dilution
DL	Detection Limit
E	The associated compound concentration exceeded the calibration range of the instrument
H	Recovery and/or RPD was outside laboratory acceptance limits
I	Chemical Interference
IS	Internal Standard
J	The amount detected is below the Reporting Limit/LOQ
LOD	Limit of Detection
LOQ	Limit of Quantitation
M	Estimated Maximum Possible Concentration (CA Region 2 projects only)
MDL	Method Detection Limit
NA	Not applicable
ND	Not Detected
OPR	Ongoing Precision and Recovery sample
P	The reported concentration may include contribution from chlorinated diphenyl ether(s).
Q	The ion transition ratio is outside of the acceptance criteria.
RL	Reporting Limit
TEQ	Toxic Equivalency
U	Not Detected (specific projects only)
*	See Cover Letter

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

Vista Analytical Laboratory Certifications

Accrediting Authority	Certificate Number
Alaska Department of Environmental Conservation	17-013
Arkansas Department of Environmental Quality	19-013-0
California Department of Health – ELAP	2892
DoD ELAP - A2LA Accredited - ISO/IEC 17025:2005	3091.01
Florida Department of Health	E87777-23
Hawaii Department of Health	N/A
Louisiana Department of Environmental Quality	01977
Maine Department of Health	2018017
Massachusetts Department of Environmental Protection	N/A
Michigan Department of Environmental Quality	9932
Minnesota Department of Health	1521520
New Hampshire Environmental Accreditation Program	207718-B
New Jersey Department of Environmental Protection	190001
New York Department of Health	11411
Oregon Laboratory Accreditation Program	4042-010
Pennsylvania Department of Environmental Protection	016
Texas Commission on Environmental Quality	T104704189-19-10
Vermont Department of Health	VT-4042
Virginia Department of General Services	10272
Washington Department of Ecology	C584-19
Wisconsin Department of Natural Resources	998036160

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

NELAP Accredited Test Methods

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

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

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

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

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

Vista Analytical

1104 Windfield Way
El Dorado Hills, CA 95762
TEL: 916-673-1520

2001444

1.0°C

Vista PM: Jade White-Dobbs

CHAIN OF CUSTODY RECORD

DATE: 7/9/20

PAGE: 1 OF 1

LABORATORY CLIENT: KMEA	CLIENT PROJECT NAME / NUMBER: MCAS El Toro and Tustin, PFAS
ADDRESS: 9210 Sky Park Court, Suite 220	PROJECT CONTACT: Kimberly Shiroodi / Brian Johnson
CITY: San Diego, CA 92123	SAMPLER(S): (SIGNATURE) Ulf Rubbe
TEL: (619) 399-5900	E-Mail: kimberly.shiroodi@woodplc.com
E-MAIL: brian.johnson@woodplc.com	P.O. NO.: TO 008 Mod 4
CONTRACT NO.: N62473-16-D-2405	LAB USE ONLY

TURNAROUND TIME

☐ SAME DAY ☐ 24 HR ☐ 48HR ☐ 72 HR ☐ 10 DAYS ☒ Standard

SPECIAL REQUIREMENTS (ADDITIONAL COSTS MAY APPLY)

☐ RWQCB REPORTING ☐ ARCHIVE SAMPLES UNTIL ____/____/____

SPECIAL INSTRUCTIONS

GW Samples potentially contain elevated levels of PFAS
* filter as needed

REQUESTED ANALYSIS

LAB USE ONLY	SAMPLE ID	SAMPLING DATE	SAMPLING TIME	Matrix	#Cont	QC Level	PFAS by LC/MS-MS
	EB07-20200709	7/9/20	14:00	GW	2		X
	TW27S-20200709		13:00	GW	4*	IV	X
	TW22S-20200709		14:00	"	4*	IV	X
	TW10D-20200709		8:20	"	4*	IV	X
	TW11D-20200709		10:25	"	5*	IV	X
	TW12D-20200709		12:15	"	4*	IV	X
	TW13D-20200709		14:00	"	4*	IV	X
	TW14D-20200709		15:30	"	4*	IV	X

Ulf 7-9-20

Relinquished by: (Signature) Ulf Rubbe	Received by: (Signature) / Carrier Tracking Number FedEx	Date: 7/9/20	Time: 16:30
Relinquished by: (Signature) FEDEX 07/10/20 09:11	Received by: (Signature) William R Walker	Date: 07/10/20	Time: 09:11
Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:

Vista Analytical Laboratory

Sample Log-In Checklist

Page # 1 of 1

Vista Work Order #: 2001444 TAT Std

Samples Arrival:	**Date/Time** 07/10/20 09:11		**Initials:** WRW		**Location:** WR-2 **Shelf/Rack:** N/A		
Delivered By:	FedEx	UPS	On Trac	GLS	DHL	Hand Delivered	Other
Preservation:	Ice		Blue Ice		Dry Ice		None
Temp °C: 1.0 (uncorrected) **Temp °C:** 1.0 (corrected)			**Probe used:** Y / N		**Thermometer ID:** IR-3		

	YES	NO	NA
Shipping Container(s) Intact?	✓	✓	
Shipping Custody Seals Intact?	✓		
Airbill — Trk # 8157 3508 5361	✓		
Shipping Documentation Present?	✓		
Shipping Container: Vista / Client / Retain / Return / Dispose			
Chain of Custody / Sample Documentation Present?	✓		
Chain of Custody / Sample Documentation Complete?	✓		
Holding Time Acceptable?	✓		

Logged In:	**Date/Time** 07/10/20 0948	**Initials:** KS	**Location:** R-13 / WR-2 **Shelf/Rack:** A-2 / B-4	
COC Anomaly/Sample Acceptance Form completed?			✓	✓

Comments:

CoC/Label Reconciliation Report WO# 2001444

LabNumber	CoC Sample ID	SampleAlias	Sample Date/Time	Container	BaseMatrix	Sample Comments
2001444-01	A EB07-20200709		09-Jul-20 14:00	HDPE Bottle, 250 mL	Aqueous	
2001444-01	B EB07-20200709		09-Jul-20 14:00	HDPE Bottle, 250 mL	Aqueous	
2001444-02	A TW27S-20200709		09-Jul-20 13:00	HDPE Bottle, 250 mL	Aqueous	
2001444-02	B TW27S-20200709		09-Jul-20 13:00	HDPE Bottle, 250 mL	Aqueous	
2001444-02	C TW27S-20200709		09-Jul-20 13:00	HDPE Bottle, 250 mL	Aqueous	
2001444-02	D TW27S-20200709		09-Jul-20 13:00	HDPE Bottle, 250 mL	Aqueous	
2001444-03	A TW22S-20200709		09-Jul-20 14:00	HDPE Bottle, 250 mL	Aqueous	
2001444-03	B TW22S-20200709		09-Jul-20 14:00	HDPE Bottle, 250 mL	Aqueous	
2001444-03	C TW22S-20200709		09-Jul-20 14:00	HDPE Bottle, 250 mL	Aqueous	
2001444-03	D TW22S-20200709		09-Jul-20 14:00	HDPE Bottle, 250 mL	Aqueous	
2001444-04	A TW10D-20200709		09-Jul-20 08:20	HDPE Bottle, 250 mL	Aqueous	
2001444-04	B TW10D-20200709		09-Jul-20 08:20	HDPE Bottle, 250 mL	Aqueous	
2001444-04	C TW10D-20200709		09-Jul-20 08:20	HDPE Bottle, 250 mL	Aqueous	
2001444-04	D TW10D-20200709		09-Jul-20 08:20	HDPE Bottle, 250 mL	Aqueous	
2001444-05	A TW11D-20200709		09-Jul-20 10:25	HDPE Bottle, 250 mL	Aqueous	
2001444-05	B TW11D-20200709		09-Jul-20 10:25	HDPE Bottle, 250 mL	Aqueous	
2001444-05	C TW11D-20200709		09-Jul-20 10:25	HDPE Bottle, 250 mL	Aqueous	
2001444-05	D TW11D-20200709		09-Jul-20 10:25	HDPE Bottle, 250 mL	Aqueous	
2001444-05	E TW11D-20200709		09-Jul-20 10:25	HDPE Bottle, 250 mL	Aqueous	
2001444-06	A TW12D-20200709		09-Jul-20 12:15	HDPE Bottle, 250 mL	Aqueous	
2001444-06	B TW12D-20200709		09-Jul-20 12:15	HDPE Bottle, 250 mL	Aqueous	
2001444-06	C TW12D-20200709		09-Jul-20 12:15	HDPE Bottle, 250 mL	Aqueous	
2001444-06	D TW12D-20200709		09-Jul-20 12:15	HDPE Bottle, 250 mL	Aqueous	
2001444-07	A TW13D-20200709		09-Jul-20 14:00	HDPE Bottle, 250 mL	Aqueous	
2001444-07	B TW13D-20200709		09-Jul-20 14:00	HDPE Bottle, 250 mL	Aqueous	
2001444-07	C TW13D-20200709		09-Jul-20 14:00	HDPE Bottle, 250 mL	Aqueous	
2001444-07	D TW13D-20200709		09-Jul-20 14:00	HDPE Bottle, 250 mL	Aqueous	
2001444-08	A TW14D-20200709		09-Jul-20 15:30	HDPE Bottle, 250 mL	Aqueous	
2001444-08	B TW14D-20200709		09-Jul-20 15:30	HDPE Bottle, 250 mL	Aqueous	

2001444-08	C TW14D-20200709	☑	09-Jul-20 15:30	☑	HDPE Bottle, 250 mL	Aqueous
2001444-08	D TW14D-20200709	☑	09-Jul-20 15:30	☑	HDPE Bottle, 250 mL	Aqueous

Checkmarks indicate that information on the COC reconciled with the sample label.
Any discrepancies are noted in the following columns.

	Yes	No	NA
Sample Container Intact?	✓		
Sample Custody Seals Intact?			✓
Adequate Sample Volume?	✓		
Container Type Appropriate for Analysis(es)	✓		
Preservation Documented: Na2S2O3 Trizma (None) Other		✓	✓
If Chlorinated or Drinking Water Samples, Acceptable Preservation?			✓

Comments: (A) All sample (except EB) contain particulate

Verifed by/Date: KA 07/10/20

"sys_sample_code","lab_anl_method_name","analysis_date","analysis_time","total_or_dissolved","column_number","test_type","cas_rn","chemical_name","result_value","result_error_delta","result_type_code","reportable_result","detect_flag","lab_qualifiers","organic_yn","method_detection_limit","reporting_detection_limit","quantatation_limit","result_unit","detection_limit_unit","tic_retention_time","result_comment","qc_original_conc","qc_spike_added","qc_spike_measured","qc_spike_recovery","qc_dup_original_conc","qc_dup_spike_added","qc_dup_spike_measured","qc_dup_spike_recovery","qc_rpd","qc_spike_lcl","qc_spike_ucl","qc_rpd_cl","qc_spike_status","qc_dup_spike_status","qc_rpd_status"
"EB07-20200709","537_MOD","07/21/20","20:53","N","NA","000","375-73-
5","PFBS","","","TRG","Yes","N","U","Y","0.00138","0.00201","0.00402","UG_L","UG_L","","","","","","","","","
","","","","","","",""
"EB07-20200709","537_MOD","07/21/20","20:53","N","NA","000","307-24-4","PERFLUOROHEXANOIC ACID
(PFHXA)","","","TRG","Yes","N","U","Y","0.00138","0.00201","0.00402","UG_L","UG_L","","","","","","","","","
","","","","","","",""
"EB07-20200709","537_MOD","07/21/20","20:53","N","NA","000","13252-13-6","HEXAFLUOROPROPYLENE
OXIDE DIMER ACID (HFPO-
DA)","","","TRG","Yes","N","U","Y","0.00242","0.00301","0.00402","UG_L","UG_L","","","","","","","","","","","","
","","","",""
"EB07-20200709","537_MOD","07/21/20","20:53","N","NA","000","375-85-9","PERFLUOROHEPTANOIC ACID
(PFHPA)","","","TRG","Yes","N","U","Y","0.00138","0.00201","0.00402","UG_L","UG_L","","","","","","","","",""
,"","","","","","",""
"EB07-20200709","537_MOD","07/21/20","20:53","N","NA","000","919005-14-4","4,8-DIOXA-3H-
PERFLUORONONANOIC ACID
(ADONA)","","","TRG","Yes","N","U","Y","0.00138","0.00201","0.00402","UG_L","UG_L","","","","","","","","",
"","","","","","","",""
"EB07-20200709","537_MOD","07/21/20","20:53","N","NA","000","355-46-4","PERFLUOROHEXANESULFONIC
ACID
(PFHXS)","","","TRG","Yes","N","U","Y","0.00138","0.00201","0.00402","UG_L","UG_L","","","","","","","","",""
,"","","","","","",""
"EB07-20200709","537_MOD","07/21/20","20:53","N","NA","000","335-67-1","PERFLUOROOCTANOIC ACID
(PFOA)","","","TRG","Yes","N","U","Y","0.00138","0.00201","0.00402","UG_L","UG_L","","","","","","","","","",
"","","","","","",""
"EB07-20200709","537_MOD","07/21/20","20:53","N","NA","000","375-95-1","PERFLUORONONANOIC ACID
(PFNA)","","","TRG","Yes","N","U","Y","0.00138","0.00201","0.00402","UG_L","UG_L","","","","","","","","","",
"","","","","","",""
"EB07-20200709","537_MOD","07/21/20","20:53","N","NA","000","1763-23-
1","HEPTADECAFLUOROACTANESULFONIC ACID SOLUTION
","","","TRG","Yes","N","U","Y","0.00138","0.00201","0.00402","UG_L","UG_L","","","","","","","","","","","","","","
","",""
"EB07-20200709","537_MOD","07/21/20","20:53","N","NA","000","756426-58-1","9-
CHLOROHEXADECAFLUORO-3-OXANONE-1-SULFONIC ACID (9Cl-
PF3ONS)","","","TRG","Yes","N","U","Y","0.00138","0.00201","0.00402","UG_L","UG_L","","","","","","","","","
","","","","","","",""
"EB07-20200709","537_MOD","07/21/20","20:53","N","NA","000","335-76-2","PERFLUORODECANOIC ACID
(PFDA)","","","TRG","Yes","N","U","Y","0.00138","0.00201","0.00402","UG_L","UG_L","","","","","","","","","",
"","","","","","",""
"EB07-20200709","537_MOD","07/21/20","20:53","N","NA","000","2355-31-
9","MeFOSAA","","","TRG","Yes","N","U","Y","0.00138","0.00201","0.00402","UG_L","UG_L","","","","","","","","
","","","","","","","","",""
"EB07-20200709","537_MOD","07/21/20","20:53","N","NA","000","2991-50-
6","EtFOSAA","","","TRG","Yes","N","U","Y","0.00138","0.00201","0.00402","UG_L","UG_L","","","","","","","",
"","","","","","","","",""
"EB07-20200709","537_MOD","07/21/20","20:53","N","NA","000","2058-94-8","PERFLUOROUNDECANOIC
ACID

(PFUNA)","","","TRG","Yes","N","U","Y","0.00138","0.00201","0.00402","UG_L","UG_L","","","","","","","","","","
","","","","","","",""
"EB07-20200709","537_MOD","07/21/20","20:53","N","NA","000","763051-92-9","11-CHLOROEICOSAFLUORO-
3-OXAUNDECANE-1-SULFONIC ACID (11Cl-
PF3OUdS)","","","TRG","Yes","N","U","Y","0.00138","0.00201","0.00402","UG_L","UG_L","","","","","","","","","",
"","","","","","","",""
"EB07-20200709","537_MOD","07/21/20","20:53","N","NA","000","307-55-1","PERFLUORODODECANOIC ACID
(PFDOA)","","","TRG","Yes","N","U","Y","0.00138","0.00201","0.00402","UG_L","UG_L","","","","","","","","","","
","","","","","","",""
"EB07-20200709","537_MOD","07/21/20","20:53","N","NA","000","72629-94-
8","PFTrDA","","","TRG","Yes","N","U","Y","0.00138","0.00201","0.00402","UG_L","UG_L","","","","","","","","","
","","","","","","","",""
"EB07-20200709","537_MOD","07/21/20","20:53","N","NA","000","376-06-
7","PFTeDA","","","TRG","Yes","N","U","Y","0.00138","0.00201","0.00402","UG_L","UG_L","","","","","","","","","
","","","","","","","",""
"EB07-20200709","537_MOD","07/21/20","20:53","N","NA","000","13C3-PFBS","13C3-
PFBS","92.3","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","92.3","92.3","","","","","","50","150","",
"","",""
"EB07-20200709","537_MOD","07/21/20","20:53","N","NA","000","13C3-HFPO-DA","13C3-HFPO-
DA","77.7","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","77.7","77.7","","","","","","50","150","",""
,"",""
"EB07-20200709","537_MOD","07/21/20","20:53","N","NA","000","13C2-PFHxA","13C2-
PFHxA","90.7","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","90.7","90.7","","","","","","50","150","
","","",""
"EB07-20200709","537_MOD","07/21/20","20:53","N","NA","000","13C4-PFHpA","13C4-
PFHpA","82.3","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","82.3","82.3","","","","","","50","150","
","","",""
"EB07-20200709","537_MOD","07/21/20","20:53","N","NA","000","13C3-PFHxS","13C3-
PFHxS","98.5","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","98.5","98.5","","","","","","50","150","
","","",""
"EB07-20200709","537_MOD","07/21/20","20:53","N","NA","000","13C5-PFNA","13C5-
PFNA","98.7","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","98.7","98.7","","","","","","50","150",""
,"","",""
"EB07-20200709","537_MOD","07/21/20","20:53","N","NA","000","13C2-PFOA","13C2-
PFOA","91.1","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","91.1","91.1","","","","","","50","150",""
,"","",""
"EB07-20200709","537_MOD","07/21/20","20:53","N","NA","000","13C8-PFOS","13C8-
PFOS","105","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","105","105","","","","","","50","150","",""
,"",""
"EB07-20200709","537_MOD","07/21/20","20:53","N","NA","000","13C2-PFDA","13C2-
PFDA","93.8","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","93.8","93.8","","","","","","50","150",""
,"","",""
"EB07-20200709","537_MOD","07/21/20","20:53","N","NA","000","d3-MeFOSAA","d3-
MeFOSAA","87.6","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","87.6","87.6","","","","","","50","15
0","","","",""
"EB07-20200709","537_MOD","07/21/20","20:53","N","NA","000","13C2-PFUnA","13C2-
PFUnA","87.6","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","87.6","87.6","","","","","","50","150","
","","",""
"EB07-20200709","537_MOD","07/21/20","20:53","N","NA","000","d5-EtFOSAA","d5-
EtFOSAA","89.2","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","89.2","89.2","","","","","","50","150
","","","",""
"EB07-20200709","537_MOD","07/21/20","20:53","N","NA","000","13C2-PFDoA","13C2-
PFDoA","86.4","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","86.4","86.4","","","","","","50","150","
","","",""

"EB07-20200709","537_MOD","07/21/20","20:53","N","NA","000","13C2-PFTeDA","13C2-PFTeDA","77.8","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","77.8","77.8","","","","","","50","150","","","","",""
"TW27S-20200709","537_MOD","07/24/20","20:08","N","NA","DL1","375-73-5","PFBS","3.14","","TRG","Yes","Y","D","Y","0.0207","0.0302","0.0605","UG_L","UG_L",""
"TW27S-20200709","537_MOD","07/24/20","20:08","N","NA","DL1","307-24-4","PERFLUOROHEXANOIC ACID (PFHXA)","10.2","","TRG","Yes","Y","D","Y","0.0207","0.0302","0.0605","UG_L","UG_L",""
"TW27S-20200709","537_MOD","07/21/20","21:04","N","NA","000","13252-13-6","HEXAFLUOROPROPYLENE OXIDE DIMER ACID (HFPO-DA)","","","TRG","Yes","N","U","Y","0.00243","0.00302","0.00404","UG_L","UG_L",""
"TW27S-20200709","537_MOD","07/24/20","20:08","N","NA","DL1","375-85-9","PERFLUOROHEPTANOIC ACID (PFHPA)","2.04","","TRG","Yes","Y","D","Y","0.0207","0.0302","0.0605","UG_L","UG_L",""
"TW27S-20200709","537_MOD","07/21/20","21:04","N","NA","000","919005-14-4","4,8-DIOXA-3H-PERFLUORONONANOIC ACID (ADONA)","","","TRG","Yes","N","U","Y","0.00138","0.00202","0.00404","UG_L","UG_L",""
"TW27S-20200709","537_MOD","07/24/20","20:08","N","NA","DL1","355-46-4","PERFLUOROHEXANESULFONIC ACID (PFHXS)","15.7","","TRG","Yes","Y","D","Y","0.0207","0.0302","0.0605","UG_L","UG_L",""
"TW27S-20200709","537_MOD","07/24/20","20:08","N","NA","DL1","335-67-1","PERFLUOROOCTANOIC ACID (PFOA)","13.2","","TRG","Yes","Y","D","Y","0.0207","0.0302","0.0605","UG_L","UG_L",""
"TW27S-20200709","537_MOD","07/21/20","21:04","N","NA","000","375-95-1","PERFLUORONONANOIC ACID (PFNA)","0.100","","TRG","Yes","Y","","Y","0.00138","0.00202","0.00404","UG_L","UG_L",""
"TW27S-20200709","537_MOD","07/24/20","20:08","N","NA","DL1","1763-23-1","HEPTADECAFLUOROACTANESULFONIC ACID SOLUTION","12.2","","TRG","Yes","Y","D","Y","0.0207","0.0302","0.0605","UG_L","UG_L",""
"TW27S-20200709","537_MOD","07/21/20","21:04","N","NA","000","756426-58-1","9-CHLOROHEXADECAFLUORO-3-OXANONE-1-SULFONIC ACID (9Cl-PF3ONS)","","","TRG","Yes","N","U","Y","0.00138","0.00202","0.00404","UG_L","UG_L",""
"TW27S-20200709","537_MOD","07/21/20","21:04","N","NA","000","335-76-2","PERFLUORODECANOIC ACID (PFDA)","0.0167","","TRG","Yes","Y","","Y","0.00138","0.00202","0.00404","UG_L","UG_L",""
"TW27S-20200709","537_MOD","07/21/20","21:04","N","NA","000","2355-31-9","MeFOSAA","","","TRG","Yes","N","U","Y","0.00138","0.00202","0.00404","UG_L","UG_L",""
"TW27S-20200709","537_MOD","07/21/20","21:04","N","NA","000","2991-50-6","EtFOSAA","","","TRG","Yes","N","U","Y","0.00138","0.00202","0.00404","UG_L","UG_L",""
"TW27S-20200709","537_MOD","07/21/20","21:04","N","NA","000","2058-94-8","PERFLUOROUNDECANOIC ACID (PFUNA)","","","TRG","Yes","N","U","Y","0.00138","0.00202","0.00404","UG_L","UG_L",""
"TW27S-20200709","537_MOD","07/21/20","21:04","N","NA","000","763051-92-9","11-CHLOROEICOSAFLUORO-3-OXAUNDECANE-1-SULFONIC ACID (11Cl-

PF3OUdS)","","","TRG","Yes","N","U","Y","0.00138","0.00202","0.00404","UG_L","UG_L","","","","","","","","","",
"","","","","","","","",""
"TW27S-20200709","537_MOD","07/21/20","21:04","N","NA","000","307-55-1","PERFLUORODODECANOIC
ACID
(PFDOA)","","","TRG","Yes","N","U","Y","0.00138","0.00202","0.00404","UG_L","UG_L","","","","","","","","","","
","","","","","","","",""
"TW27S-20200709","537_MOD","07/21/20","21:04","N","NA","000","72629-94-
8","PFTrDA","","","TRG","Yes","N","U","Y","0.00138","0.00202","0.00404","UG_L","UG_L","","","","","","","","","
","","","","","","","","",""
"TW27S-20200709","537_MOD","07/21/20","21:04","N","NA","000","376-06-
7","PFTeDA","","","TRG","Yes","N","U","Y","0.00138","0.00202","0.00404","UG_L","UG_L","","","","","","","","","
","","","","","","","","",""
"TW27S-20200709","537_MOD","07/24/20","20:08","N","NA","DL1","13C3-PFBS","13C3-
PFBS","72.0","","IS","Yes","Y","D","Y","","","","PCT_REC","","","","","100","72.0","72.0","","","","","","50","150","
","","",""
"TW27S-20200709","537_MOD","07/21/20","21:04","N","NA","000","13C3-HFPO-DA","13C3-HFPO-
DA","83.1","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","83.1","83.1","","","","","","50","150","",""
,"",""
"TW27S-20200709","537_MOD","07/24/20","20:08","N","NA","DL1","13C2-PFHxA","13C2-
PFHxA","101","","IS","Yes","Y","D","Y","","","","PCT_REC","","","","","100","101","101","","","","","","50","150","
","","",""
"TW27S-20200709","537_MOD","07/24/20","20:08","N","NA","DL1","13C4-PFHpA","13C4-
PFHpA","101","","IS","Yes","Y","D","Y","","","","PCT_REC","","","","","100","101","101","","","","","","50","150","
","","",""
"TW27S-20200709","537_MOD","07/24/20","20:08","N","NA","DL1","13C3-PFHxS","13C3-
PFHxS","84.0","","IS","Yes","Y","D","Y","","","","PCT_REC","","","","","100","84.0","84.0","","","","","","50","150"
,"","","",""
"TW27S-20200709","537_MOD","07/21/20","21:04","N","NA","000","13C5-PFNA","13C5-
PFNA","83.1","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","83.1","83.1","","","","","","50","150",""
,"","",""
"TW27S-20200709","537_MOD","07/24/20","20:08","N","NA","DL1","13C2-PFOA","13C2-
PFOA","107","","IS","Yes","Y","D","Y","","","","PCT_REC","","","","","100","107","107","","","","","","50","150",""
,"","",""
"TW27S-20200709","537_MOD","07/24/20","20:08","N","NA","DL1","13C8-PFOS","13C8-
PFOS","94.5","","IS","Yes","Y","D","Y","","","","PCT_REC","","","","","100","94.5","94.5","","","","","","50","150","
","","",""
"TW27S-20200709","537_MOD","07/21/20","21:04","N","NA","000","13C2-PFDA","13C2-
PFDA","91.5","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","91.5","91.5","","","","","","50","150",""
,"","",""
"TW27S-20200709","537_MOD","07/21/20","21:04","N","NA","000","d3-MeFOSAA","d3-
MeFOSAA","79.3","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","79.3","79.3","","","","","","50","15
0","","","",""
"TW27S-20200709","537_MOD","07/21/20","21:04","N","NA","000","13C2-PFUnA","13C2-
PFUnA","83.0","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","83.0","83.0","","","","","","50","150","
","","",""
"TW27S-20200709","537_MOD","07/21/20","21:04","N","NA","000","d5-EtFOSAA","d5-
EtFOSAA","86.8","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","86.8","86.8","","","","","","50","150
","","","",""
"TW27S-20200709","537_MOD","07/21/20","21:04","N","NA","000","13C2-PFDoA","13C2-
PFDoA","78.6","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","78.6","78.6","","","","","","50","150","
","","",""
"TW27S-20200709","537_MOD","07/21/20","21:04","N","NA","000","13C2-PFTeDA","13C2-
PFTeDA","60.7","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","60.7","60.7","","","","","","50","150"
,"","","",""

"TW22S-20200709","537_MOD","07/23/20","12:57","N","NA","000","375-73-
5","PFBS","0.275","","TRG","Yes","Y","","Y","0.00132","0.00193","0.00386","UG_L","UG_L","","","","","","","","",
"","","","","","","","",""
"TW22S-20200709","537_MOD","07/23/20","12:57","N","NA","000","307-24-4","PERFLUOROHEXANOIC ACID
(PFHXA)","1.34","","TRG","Yes","Y","","Y","0.00132","0.00193","0.00386","UG_L","UG_L","","","","","","","","","
","","","","","","","",""
"TW22S-20200709","537_MOD","07/23/20","12:57","N","NA","000","13252-13-6","HEXAFLUOROPROPYLENE
OXIDE DIMER ACID (HFPO-
DA)","","","TRG","Yes","N","U","Y","0.00233","0.00290","0.00386","UG_L","UG_L","","","","","","","","","","","
","","","","","",""
"TW22S-20200709","537_MOD","07/23/20","12:57","N","NA","000","375-85-9","PERFLUOROHEPTANOIC ACID
(PFHPA)","0.492","","TRG","Yes","Y","","Y","0.00132","0.00193","0.00386","UG_L","UG_L","","","","","","","","","
","","","","","","","",""
"TW22S-20200709","537_MOD","07/23/20","12:57","N","NA","000","919005-14-4","4,8-DIOXA-3H-
PERFLUORONONANOIC ACID
(ADONA)","","","TRG","Yes","N","U","Y","0.00132","0.00193","0.00386","UG_L","UG_L","","","","","","","","","",
"","","","","","","",""
"TW22S-20200709","537_MOD","07/23/20","12:57","N","NA","000","355-46-
4","PERFLUOROHEXANESULFONIC ACID
(PFHXS)","1.26","","TRG","Yes","Y","","Y","0.00132","0.00193","0.00386","UG_L","UG_L","","","","","","","",""
,"","","","","","","","",""
"TW22S-20200709","537_MOD","07/23/20","12:57","N","NA","000","335-67-1","PERFLUOROOCTANOIC ACID
(PFOA)","1.42","","TRG","Yes","Y","","Y","0.00132","0.00193","0.00386","UG_L","UG_L","","","","","","","","","","
","","","","","","",""
"TW22S-20200709","537_MOD","07/23/20","12:57","N","NA","000","375-95-1","PERFLUORONONANOIC ACID
(PFNA)","0.00857","","TRG","Yes","Y","","Y","0.00132","0.00193","0.00386","UG_L","UG_L","","","","","","","",""
,"","","","","","","","",""
"TW22S-20200709","537_MOD","07/23/20","12:57","N","NA","000","1763-23-
1","HEPTADECAFLUOROACTANESULFONIC ACID SOLUTION
","0.736","","TRG","Yes","Y","","Y","0.00132","0.00193","0.00386","UG_L","UG_L","","","","","","","","","","",""
,"","","","","",""
"TW22S-20200709","537_MOD","07/23/20","12:57","N","NA","000","756426-58-1","9-
CHLOROHEXADECAFLUORO-3-OXANONE-1-SULFONIC ACID (9Cl-
PF3ONS)","","","TRG","Yes","N","U","Y","0.00132","0.00193","0.00386","UG_L","UG_L","","","","","","","","","","
","","","","","","",""
"TW22S-20200709","537_MOD","07/23/20","12:57","N","NA","000","335-76-2","PERFLUORODECANOIC ACID
(PFDA)","","","TRG","Yes","N","U","Y","0.00132","0.00193","0.00386","UG_L","UG_L","","","","","","","","","","",
"","","","","","",""
"TW22S-20200709","537_MOD","07/23/20","12:57","N","NA","000","2355-31-
9","MeFOSAA","","","TRG","Yes","N","U","Y","0.00132","0.00193","0.00386","UG_L","UG_L","","","","","","","","
","","","","","","","","",""
"TW22S-20200709","537_MOD","07/23/20","12:57","N","NA","000","2991-50-
6","EtFOSAA","","","TRG","Yes","N","U","Y","0.00132","0.00193","0.00386","UG_L","UG_L","","","","","","","","",
"","","","","","","","",""
"TW22S-20200709","537_MOD","07/23/20","12:57","N","NA","000","2058-94-8","PERFLUOROUNDECANOIC
ACID
(PFUNA)","","","TRG","Yes","N","U","Y","0.00132","0.00193","0.00386","UG_L","UG_L","","","","","","","","","","
","","","","","","",""
"TW22S-20200709","537_MOD","07/23/20","12:57","N","NA","000","763051-92-9","11-
CHLOROEICOSAFLUORO-3-OXAUNDECANE-1-SULFONIC ACID (11Cl-
PF3OUdS)","","","TRG","Yes","N","U","Y","0.00132","0.00193","0.00386","UG_L","UG_L","","","","","","","","","",
"","","","","","","",""
"TW22S-20200709","537_MOD","07/23/20","12:57","N","NA","000","307-55-1","PERFLUORODODECANOIC
ACID

(PFDOA)","","","TRG","Yes","N","U","Y","0.00132","0.00193","0.00386","UG_L","UG_L","","","","","","","","","","
","","","","","","",""
"TW22S-20200709","537_MOD","07/23/20","12:57","N","NA","000","72629-94-
8","PFTrDA","","","TRG","Yes","N","U","Y","0.00132","0.00193","0.00386","UG_L","UG_L","","","","","","","","","
","","","","","","","",""
"TW22S-20200709","537_MOD","07/23/20","12:57","N","NA","000","376-06-
7","PFTeDA","","","TRG","Yes","N","U","Y","0.00132","0.00193","0.00386","UG_L","UG_L","","","","","","","","","
","","","","","","","",""
"TW22S-20200709","537_MOD","07/23/20","12:57","N","NA","000","13C3-PFBS","13C3-
PFBS","90.4","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","90.4","90.4","","","","","","50","150","",
"","",""
"TW22S-20200709","537_MOD","07/23/20","12:57","N","NA","000","13C3-HFPO-DA","13C3-HFPO-
DA","82.3","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","82.3","82.3","","","","","","50","150","",""
,"",""
"TW22S-20200709","537_MOD","07/23/20","12:57","N","NA","000","13C2-PFHxA","13C2-
PFHxA","79.4","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","79.4","79.4","","","","","","50","150","
","","",""
"TW22S-20200709","537_MOD","07/23/20","12:57","N","NA","000","13C4-PFHpA","13C4-
PFHpA","87.2","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","87.2","87.2","","","","","","50","150","
","","",""
"TW22S-20200709","537_MOD","07/23/20","12:57","N","NA","000","13C3-PFHxS","13C3-
PFHxS","82.3","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","82.3","82.3","","","","","","50","150","
","","",""
"TW22S-20200709","537_MOD","07/23/20","12:57","N","NA","000","13C5-PFNA","13C5-
PFNA","87.9","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","87.9","87.9","","","","","","50","150",""
,"","",""
"TW22S-20200709","537_MOD","07/23/20","12:57","N","NA","000","13C2-PFOA","13C2-
PFOA","87.8","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","87.8","87.8","","","","","","50","150",""
,"","",""
"TW22S-20200709","537_MOD","07/23/20","12:57","N","NA","000","13C8-PFOS","13C8-
PFOS","84.0","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","84.0","84.0","","","","","","50","150","",
"","",""
"TW22S-20200709","537_MOD","07/23/20","12:57","N","NA","000","13C2-PFDA","13C2-
PFDA","83.0","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","83.0","83.0","","","","","","50","150",""
,"","",""
"TW22S-20200709","537_MOD","07/23/20","12:57","N","NA","000","d3-MeFOSAA","d3-
MeFOSAA","90.2","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","90.2","90.2","","","","","","50","15
0","","","",""
"TW22S-20200709","537_MOD","07/23/20","12:57","N","NA","000","13C2-PFUnA","13C2-
PFUnA","84.7","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","84.7","84.7","","","","","","50","150","
","","",""
"TW22S-20200709","537_MOD","07/23/20","12:57","N","NA","000","d5-EtFOSAA","d5-
EtFOSAA","75.2","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","75.2","75.2","","","","","","50","150
","","","",""
"TW22S-20200709","537_MOD","07/23/20","12:57","N","NA","000","13C2-PFDoA","13C2-
PFDoA","74.5","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","74.5","74.5","","","","","","50","150","
","","",""
"TW22S-20200709","537_MOD","07/23/20","12:57","N","NA","000","13C2-PFTeDA","13C2-
PFTeDA","67.5","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","67.5","67.5","","","","","","50","150"
,"","","",""
"TW10D-20200709","537_MOD","07/21/20","21:25","N","NA","000","375-73-
5","PFBS","0.101","","TRG","Yes","Y","","Y","0.00122","0.00178","0.00356","UG_L","UG_L","","","","","","","","",
"","","","","","","","",""
"TW10D-20200709","537_MOD","07/21/20","21:25","N","NA","000","307-24-4","PERFLUOROHEXANOIC ACID

(PFHXA)","0.224","","TRG","Yes","Y","","Y","0.00122","0.00178","0.00356","UG_L","UG_L","","","","","","","","",
"","","","","","","","",""
"TW10D-20200709","537_MOD","07/21/20","21:25","N","NA","000","13252-13-6","HEXAFLUOROPROPYLENE OXIDE DIMER ACID (HFPO-DA)","","","TRG","Yes","N","U","Y","0.00215","0.00267","0.00356","UG_L","UG_L","","","","","","","","","","","
","","","","","",""
"TW10D-20200709","537_MOD","07/21/20","21:25","N","NA","000","375-85-9","PERFLUOROHEPTANOIC ACID (PFHPA)","0.0956","","TRG","Yes","Y","","Y","0.00122","0.00178","0.00356","UG_L","UG_L","","","","","","","",""
,"","","","","","","","",""
"TW10D-20200709","537_MOD","07/21/20","21:25","N","NA","000","919005-14-4","4,8-DIOXA-3H-PERFLUORONONANOIC ACID (ADONA)","","","TRG","Yes","N","U","Y","0.00122","0.00178","0.00356","UG_L","UG_L","","","","","","","","","",
"","","","","","","",""
"TW10D-20200709","537_MOD","07/21/20","21:25","N","NA","000","355-46-4","PERFLUOROHEXANESULFONIC ACID (PFHXS)","0.664","","TRG","Yes","Y","","Y","0.00122","0.00178","0.00356","UG_L","UG_L","","","","","","","","","
","","","","","","","",""
"TW10D-20200709","537_MOD","07/21/20","21:25","N","NA","000","335-67-1","PERFLUOROOCTANOIC ACID (PFOA)","0.854","","TRG","Yes","Y","","Y","0.00122","0.00178","0.00356","UG_L","UG_L","","","","","","","",""
,"","","","","","","","",""
"TW10D-20200709","537_MOD","07/21/20","21:25","N","NA","000","375-95-1","PERFLUORONONANOIC ACID (PFNA)","0.00322","","TRG","Yes","Y","J","Y","0.00122","0.00178","0.00356","UG_L","UG_L","","","","","","","","
","","","","","","","","","",""
"TW10D-20200709","537_MOD","07/21/20","21:25","N","NA","000","1763-23-1","HEPTADECAFLUOROACTANESULFONIC ACID SOLUTION
","0.531","","TRG","Yes","Y","","Y","0.00122","0.00178","0.00356","UG_L","UG_L","","","","","","","","","","",""
,"","","","",""
"TW10D-20200709","537_MOD","07/21/20","21:25","N","NA","000","756426-58-1","9-CHLOROHEXADECAFLUORO-3-OXANONE-1-SULFONIC ACID (9Cl-PF3ONS)","","","TRG","Yes","N","U","Y","0.00122","0.00178","0.00356","UG_L","UG_L","","","","","","","","","","
","","","","","","",""
"TW10D-20200709","537_MOD","07/21/20","21:25","N","NA","000","335-76-2","PERFLUORODECANOIC ACID (PFDA)","","","TRG","Yes","N","U","Y","0.00122","0.00178","0.00356","UG_L","UG_L","","","","","","","","","","",
"","","","","","",""
"TW10D-20200709","537_MOD","07/21/20","21:25","N","NA","000","2355-31-9","MeFOSAA","","","TRG","Yes","N","U","Y","0.00122","0.00178","0.00356","UG_L","UG_L","","","","","","","","
","","","","","","","","","",""
"TW10D-20200709","537_MOD","07/21/20","21:25","N","NA","000","2991-50-6","EtFOSAA","","","TRG","Yes","N","U","Y","0.00122","0.00178","0.00356","UG_L","UG_L","","","","","","","","",
"","","","","","","","",""
"TW10D-20200709","537_MOD","07/21/20","21:25","N","NA","000","2058-94-8","PERFLUOROUNDECANOIC ACID (PFUNA)","","","TRG","Yes","N","U","Y","0.00122","0.00178","0.00356","UG_L","UG_L","","","","","","","","","","
","","","","","","",""
"TW10D-20200709","537_MOD","07/21/20","21:25","N","NA","000","763051-92-9","11-CHLOROEICOSAFLUORO-3-OXAUNDECANE-1-SULFONIC ACID (11Cl-PF3OUdS)","","","TRG","Yes","N","U","Y","0.00122","0.00178","0.00356","UG_L","UG_L","","","","","","","","","",
"","","","","","","",""
"TW10D-20200709","537_MOD","07/21/20","21:25","N","NA","000","307-55-1","PERFLUORODODECANOIC ACID (PFDOA)","","","TRG","Yes","N","U","Y","0.00122","0.00178","0.00356","UG_L","UG_L","","","","","","","","","","
","","","","","","",""
"TW10D-20200709","537_MOD","07/21/20","21:25","N","NA","000","72629-94-8","PFTrDA","","","TRG","Yes","N","U","Y","0.00122","0.00178","0.00356","UG_L","UG_L","","","","","","","","

","","","","","","","","","","
"TW10D-20200709","537_MOD","07/21/20","21:25","N","NA","000","376-06-7","PFTeDA","","","TRG","Yes","N","U","Y","0.00122","0.00178","0.00356","UG_L","UG_L","
"TW10D-20200709","537_MOD","07/21/20","21:25","N","NA","000","13C3-PFBS","13C3-PFBS","85.6","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","85.6","85.6","","","","","","50","150","","","","",""
"TW10D-20200709","537_MOD","07/21/20","21:25","N","NA","000","13C3-HFPO-DA","13C3-HFPO-DA","79.4","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","79.4","79.4","","","","","","50","150","","","","",""
"TW10D-20200709","537_MOD","07/21/20","21:25","N","NA","000","13C2-PFHxA","13C2-PFHxA","78.9","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","78.9","78.9","","","","","","50","150","","","","","","
"TW10D-20200709","537_MOD","07/21/20","21:25","N","NA","000","13C4-PFHpA","13C4-PFHpA","75.9","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","75.9","75.9","","","","","","50","150","","","","","","
"TW10D-20200709","537_MOD","07/21/20","21:25","N","NA","000","13C3-PFHxS","13C3-PFHxS","84.2","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","84.2","84.2","","","","","","50","150","","","","","","
"TW10D-20200709","537_MOD","07/21/20","21:25","N","NA","000","13C5-PFNA","13C5-PFNA","81.8","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","81.8","81.8","","","","","","50","150","","","","","","
"TW10D-20200709","537_MOD","07/21/20","21:25","N","NA","000","13C2-PFOA","13C2-PFOA","82.9","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","82.9","82.9","","","","","","50","150","","","","","","
"TW10D-20200709","537_MOD","07/21/20","21:25","N","NA","000","13C8-PFOS","13C8-PFOS","76.8","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","76.8","76.8","","","","","","50","150","","","","","","
"TW10D-20200709","537_MOD","07/21/20","21:25","N","NA","000","13C2-PFDA","13C2-PFDA","78.0","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","78.0","78.0","","","","","","50","150","","","","","","
"TW10D-20200709","537_MOD","07/21/20","21:25","N","NA","000","d3-MeFOSAA","d3-MeFOSAA","63.2","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","63.2","63.2","","","","","","50","150","","","","","","
"TW10D-20200709","537_MOD","07/21/20","21:25","N","NA","000","13C2-PFUnA","13C2-PFUnA","63.2","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","63.2","63.2","","","","","","50","150","","","","","","
"TW10D-20200709","537_MOD","07/21/20","21:25","N","NA","000","d5-EtFOSAA","d5-EtFOSAA","66.1","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","66.1","66.1","","","","","","50","150","","","","","","","
"TW10D-20200709","537_MOD","07/21/20","21:25","N","NA","000","13C2-PFDoA","13C2-PFDoA","52.7","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","52.7","52.7","","","","","","50","150","","","","","","
"TW10D-20200709","537_MOD","07/21/20","21:25","N","NA","000","13C2-PFTeDA","13C2-PFTeDA","14.5","","IS","Yes","Y","H","Y","","","","PCT_REC","","","","","100","14.5","14.5","","","","","","50","150","","*","","","
"TW11D-20200709","537_MOD","07/21/20","22:07","N","NA","000","375-73-5","PFBS","0.0407","","TRG","Yes","Y","","Y","0.000903","0.00132","0.00264","UG_L","UG_L","
"TW11D-20200709","537_MOD","07/21/20","22:07","N","NA","000","307-24-4","PERFLUOROHEXANOIC ACID (PFHXA)","0.109","","TRG","Yes","Y","","Y","0.000903","0.00132","0.00264","UG_L","UG_L","
"TW11D-20200709","537_MOD","07/21/20","22:07","N","NA","000","13252-13-6","HEXAFLUOROPROPYLENE OXIDE DIMER ACID (HFPO-

DA)","","","TRG","Yes","N","U","Y","0.00159","0.00198","0.00264","UG_L","UG_L","","","","","","","","","","","","
","","","","",""
"TW11D-20200709","537_MOD","07/21/20","22:07","N","NA","000","375-85-9","PERFLUOROHEPTANOIC ACID
(PFHPA)","0.0377","","TRG","Yes","Y","","Y","0.000903","0.00132","0.00264","UG_L","UG_L","","","","","","","","
","","","","","","","","","",""
"TW11D-20200709","537_MOD","07/21/20","22:07","N","NA","000","919005-14-4","4,8-DIOXA-3H-
PERFLUORONONANOIC ACID
(ADONA)","","","TRG","Yes","N","U","Y","0.000903","0.00132","0.00264","UG_L","UG_L","","","","","","","","",""
,"","","","","","","",""
"TW11D-20200709","537_MOD","07/21/20","22:07","N","NA","000","355-46-
4","PERFLUOROHEXANESULFONIC ACID
(PFHXS)","0.233","","TRG","Yes","Y","","Y","0.000903","0.00132","0.00264","UG_L","UG_L","","","","","","","",""
,"","","","","","","","",""
"TW11D-20200709","537_MOD","07/21/20","22:07","N","NA","000","335-67-1","PERFLUOROOCTANOIC ACID
(PFOA)","0.184","","TRG","Yes","Y","","Y","0.000903","0.00132","0.00264","UG_L","UG_L","","","","","","","","
","","","","","","","",""
"TW11D-20200709","537_MOD","07/21/20","22:07","N","NA","000","375-95-1","PERFLUORONONANOIC ACID
(PFNA)","0.00164","","TRG","Yes","Y","J","Y","0.000903","0.00132","0.00264","UG_L","UG_L","","","","","","","",
"","","","","","","","","",""
"TW11D-20200709","537_MOD","07/21/20","22:07","N","NA","000","1763-23-
1","HEPTADECAFLUOROACTANESULFONIC ACID SOLUTION
","0.305","","TRG","Yes","Y","","Y","0.000903","0.00132","0.00264","UG_L","UG_L","","","","","","","","","","","
","","","","",""
"TW11D-20200709","537_MOD","07/21/20","22:07","N","NA","000","756426-58-1","9-
CHLOROHEXADECAFLUORO-3-OXANONE-1-SULFONIC ACID (9Cl-
PF3ONS)","","","TRG","Yes","N","U","Y","0.000903","0.00132","0.00264","UG_L","UG_L","","","","","","","","","",
"","","","","","","",""
"TW11D-20200709","537_MOD","07/21/20","22:07","N","NA","000","335-76-2","PERFLUORODECANOIC ACID
(PFDA)","","","TRG","Yes","N","U","Y","0.000903","0.00132","0.00264","UG_L","UG_L","","","","","","","","","",""
,"","","","","","",""
"TW11D-20200709","537_MOD","07/21/20","22:07","N","NA","000","2355-31-
9","MeFOSAA","","","TRG","Yes","N","U","Y","0.000903","0.00132","0.00264","UG_L","UG_L","","","","","","","",
"","","","","","","","","",""
"TW11D-20200709","537_MOD","07/21/20","22:07","N","NA","000","2991-50-
6","EtFOSAA","","","TRG","Yes","N","U","Y","0.000903","0.00132","0.00264","UG_L","UG_L","","","","","","","","
","","","","","","","","","",""
"TW11D-20200709","537_MOD","07/21/20","22:07","N","NA","000","2058-94-8","PERFLUOROUNDECANOIC
ACID
(PFUNA)","","","TRG","Yes","N","U","Y","0.000903","0.00132","0.00264","UG_L","UG_L","","","","","","","","","",
"","","","","","","",""
"TW11D-20200709","537_MOD","07/21/20","22:07","N","NA","000","763051-92-9","11-
CHLOROEICOSAFLUORO-3-OXAUNDECANE-1-SULFONIC ACID (11Cl-
PF3OUdS)","","","TRG","Yes","N","U","Y","0.000903","0.00132","0.00264","UG_L","UG_L","","","","","","","","","
","","","","","","","","",""
"TW11D-20200709","537_MOD","07/21/20","22:07","N","NA","000","307-55-1","PERFLUORODODECANOIC
ACID
(PFDOA)","","","TRG","Yes","N","U","Y","0.000903","0.00132","0.00264","UG_L","UG_L","","","","","","","","","",
"","","","","","","",""
"TW11D-20200709","537_MOD","07/21/20","22:07","N","NA","000","72629-94-
8","PFTrDA","","","TRG","Yes","N","U","Y","0.000903","0.00132","0.00264","UG_L","UG_L","","","","","","","",
"","","","","","","","","",""
"TW11D-20200709","537_MOD","07/21/20","22:07","N","NA","000","376-06-
7","PFTeDA","","","TRG","Yes","N","U","Y","0.000903","0.00132","0.00264","UG_L","UG_L","","","","","","","",
"","","","","","","","","",""

"TW11D-20200709","537_MOD","07/21/20","22:07","N","NA","000","13C3-PFBS","13C3-PFBS","70.6","","IS","Yes","Y","","Y","","","","","PCT_REC","","","","","100","70.6","70.6","","","","","","50","150","","","","",""
"TW11D-20200709","537_MOD","07/21/20","22:07","N","NA","000","13C3-HFPO-DA","13C3-HFPO-DA","57.5","","IS","Yes","Y","","Y","","","","","PCT_REC","","","","","100","57.5","57.5","","","","","","50","150","","","","",""
"TW11D-20200709","537_MOD","07/21/20","22:07","N","NA","000","13C2-PFHxA","13C2-PFHxA","63.1","","IS","Yes","Y","","Y","","","","","PCT_REC","","","","","100","63.1","63.1","","","","","","50","150","","","","",""
"TW11D-20200709","537_MOD","07/21/20","22:07","N","NA","000","13C4-PFHpA","13C4-PFHpA","62.4","","IS","Yes","Y","","Y","","","","","PCT_REC","","","","","100","62.4","62.4","","","","","","50","150","","","","",""
"TW11D-20200709","537_MOD","07/21/20","22:07","N","NA","000","13C3-PFHxS","13C3-PFHxS","68.4","","IS","Yes","Y","","Y","","","","","PCT_REC","","","","","100","68.4","68.4","","","","","","50","150","","","","",""
"TW11D-20200709","537_MOD","07/21/20","22:07","N","NA","000","13C5-PFNA","13C5-PFNA","68.6","","IS","Yes","Y","","Y","","","","","PCT_REC","","","","","100","68.6","68.6","","","","","","50","150","","","","",""
"TW11D-20200709","537_MOD","07/21/20","22:07","N","NA","000","13C2-PFOA","13C2-PFOA","62.9","","IS","Yes","Y","","Y","","","","","PCT_REC","","","","","100","62.9","62.9","","","","","","50","150","","","","",""
"TW11D-20200709","537_MOD","07/21/20","22:07","N","NA","000","13C8-PFOS","13C8-PFOS","64.2","","IS","Yes","Y","","Y","","","","","PCT_REC","","","","","100","64.2","64.2","","","","","","50","150","","","","",""
"TW11D-20200709","537_MOD","07/21/20","22:07","N","NA","000","13C2-PFDA","13C2-PFDA","59.8","","IS","Yes","Y","","Y","","","","","PCT_REC","","","","","100","59.8","59.8","","","","","","50","150","","","","",""
"TW11D-20200709","537_MOD","07/21/20","22:07","N","NA","000","d3-MeFOSAA","d3-MeFOSAA","40.0","","IS","Yes","Y","H","Y","","","","","PCT_REC","","","","","100","40.0","40.0","","","","","","50","150","","*","","",""
"TW11D-20200709","537_MOD","07/21/20","22:07","N","NA","000","13C2-PFUnA","13C2-PFUnA","43.6","","IS","Yes","Y","H","Y","","","","","PCT_REC","","","","","100","43.6","43.6","","","","","","50","150","","*","","",""
"TW11D-20200709","537_MOD","07/21/20","22:07","N","NA","000","d5-EtFOSAA","d5-EtFOSAA","42.9","","IS","Yes","Y","H","Y","","","","","PCT_REC","","","","","100","42.9","42.9","","","","","","50","150","","*","","",""
"TW11D-20200709","537_MOD","07/21/20","22:07","N","NA","000","13C2-PFDoA","13C2-PFDoA","27.5","","IS","Yes","Y","H","Y","","","","","PCT_REC","","","","","100","27.5","27.5","","","","","","50","150","","*","","",""
"TW11D-20200709","537_MOD","07/21/20","22:07","N","NA","000","13C2-PFTeDA","13C2-PFTeDA","6.00","","IS","Yes","Y","H","Y","","","","","PCT_REC","","","","","100","6.00","6.00","","","","","","50","150","","*","","",""
"TW12D-20200709","537_MOD","07/21/20","22:18","N","NA","000","375-73-5","PFBS","0.0982","","TRG","Yes","Y","","Y","0.000970","0.00142","0.00283","UG_L","UG_L",""
"TW12D-20200709","537_MOD","07/21/20","22:18","N","NA","000","307-24-4","PERFLUOROHEXANOIC ACID (PFHXA)","0.664","","TRG","Yes","Y","","Y","0.000970","0.00142","0.00283","UG_L","UG_L",""
"TW12D-20200709","537_MOD","07/21/20","22:18","N","NA","000","13252-13-6","HEXAFLUOROPROPYLENE OXIDE DIMER ACID (HFPO-DA)","","","TRG","Yes","N","U","Y","0.00171","0.00212","0.00283","UG_L","UG_L",""
"TW12D-20200709","537_MOD","07/21/20","22:18","N","NA","000","375-85-9","PERFLUOROHEPTANOIC ACID (PFHPA)","0.315","","TRG","Yes","Y","","Y","0.000970","0.00142","0.00283","UG_L","UG_L",""

,"","","","","","","","","","","
"TW12D-20200709","537_MOD","07/21/20","22:18","N","NA","000","919005-14-4","4,8-DIOXA-3H-PERFLUORONONANOIC ACID (ADONA)","","","TRG","Yes","N","U","Y","0.000970","0.00142","0.00283","UG_L","UG_L","
"TW12D-20200709","537_MOD","07/21/20","22:18","N","NA","000","355-46-4","PERFLUOROHEXANESULFONIC ACID (PFHXS)","0.435","","TRG","Yes","Y","","Y","0.000970","0.00142","0.00283","UG_L","UG_L","
"TW12D-20200709","537_MOD","07/21/20","22:18","N","NA","000","335-67-1","PERFLUOROOCTANOIC ACID (PFOA)","0.570","","TRG","Yes","Y","","Y","0.000970","0.00142","0.00283","UG_L","UG_L","
"TW12D-20200709","537_MOD","07/21/20","22:18","N","NA","000","375-95-1","PERFLUORONONANOIC ACID (PFNA)","0.00396","","TRG","Yes","Y","","Y","0.000970","0.00142","0.00283","UG_L","UG_L","
"TW12D-20200709","537_MOD","07/21/20","22:18","N","NA","000","1763-23-1","HEPTADECAFLUOROACTANESULFONIC ACID SOLUTION","0.198","","TRG","Yes","Y","","Y","0.000970","0.00142","0.00283","UG_L","UG_L","
"TW12D-20200709","537_MOD","07/21/20","22:18","N","NA","000","756426-58-1","9-CHLOROHEXADECAFLUORO-3-OXANONE-1-SULFONIC ACID (9Cl-PF3ONS)","","","TRG","Yes","N","U","Y","0.000970","0.00142","0.00283","UG_L","UG_L","
"TW12D-20200709","537_MOD","07/21/20","22:18","N","NA","000","335-76-2","PERFLUORODECANOIC ACID (PFDA)","","","TRG","Yes","N","U","Y","0.000970","0.00142","0.00283","UG_L","UG_L","
"TW12D-20200709","537_MOD","07/21/20","22:18","N","NA","000","2355-31-9","MeFOSAA","","","TRG","Yes","N","U","Y","0.000970","0.00142","0.00283","UG_L","UG_L","
"TW12D-20200709","537_MOD","07/21/20","22:18","N","NA","000","2991-50-6","EtFOSAA","","","TRG","Yes","N","U","Y","0.000970","0.00142","0.00283","UG_L","UG_L","
"TW12D-20200709","537_MOD","07/21/20","22:18","N","NA","000","2058-94-8","PERFLUOROUNDECANOIC ACID (PFUNA)","","","TRG","Yes","N","U","Y","0.000970","0.00142","0.00283","UG_L","UG_L","
"TW12D-20200709","537_MOD","07/21/20","22:18","N","NA","000","763051-92-9","11-CHLOROEICOSAFLUORO-3-OXAUNDECANE-1-SULFONIC ACID (11Cl-PF3OUdS)","","","TRG","Yes","N","U","Y","0.000970","0.00142","0.00283","UG_L","UG_L","
"TW12D-20200709","537_MOD","07/21/20","22:18","N","NA","000","307-55-1","PERFLUORODODECANOIC ACID (PFDOA)","","","TRG","Yes","N","U","Y","0.000970","0.00142","0.00283","UG_L","UG_L","
"TW12D-20200709","537_MOD","07/21/20","22:18","N","NA","000","72629-94-8","PFTrDA","","","TRG","Yes","N","U","Y","0.000970","0.00142","0.00283","UG_L","UG_L","
"TW12D-20200709","537_MOD","07/21/20","22:18","N","NA","000","376-06-7","PFTeDA","","","TRG","Yes","N","U","Y","0.000970","0.00142","0.00283","UG_L","UG_L","
"TW12D-20200709","537_MOD","07/21/20","22:18","N","NA","000","13C3-PFBS","13C3-PFBS","68.4","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","68.4","68.4","","","","","","50","150","","","","","
"TW12D-20200709","537_MOD","07/21/20","22:18","N","NA","000","13C3-HFPO-DA","13C3-HFPO-

DA","59.6","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","59.6","59.6","","","","","","50","150","",""
,"",""
"TW12D-20200709","537_MOD","07/21/20","22:18","N","NA","000","13C2-PFHxA","13C2-
PFHxA","62.5","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","62.5","62.5","","","","","","50","150","
","","",""
"TW12D-20200709","537_MOD","07/21/20","22:18","N","NA","000","13C4-PFHpA","13C4-
PFHpA","62.3","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","62.3","62.3","","","","","","50","150","
","","",""
"TW12D-20200709","537_MOD","07/21/20","22:18","N","NA","000","13C3-PFHxS","13C3-
PFHxS","69.4","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","69.4","69.4","","","","","","50","150","
","","",""
"TW12D-20200709","537_MOD","07/21/20","22:18","N","NA","000","13C5-PFNA","13C5-
PFNA","67.8","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","67.8","67.8","","","","","","50","150",""
,"","",""
"TW12D-20200709","537_MOD","07/21/20","22:18","N","NA","000","13C2-PFOA","13C2-
PFOA","68.5","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","68.5","68.5","","","","","","50","150",""
,"","",""
"TW12D-20200709","537_MOD","07/21/20","22:18","N","NA","000","13C8-PFOS","13C8-
PFOS","66.2","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","66.2","66.2","","","","","","50","150","",
"","",""
"TW12D-20200709","537_MOD","07/21/20","22:18","N","NA","000","13C2-PFDA","13C2-
PFDA","65.8","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","65.8","65.8","","","","","","50","150",""
,"","",""
"TW12D-20200709","537_MOD","07/21/20","22:18","N","NA","000","d3-MeFOSAA","d3-
MeFOSAA","44.9","","IS","Yes","Y","H","Y","","","","PCT_REC","","","","","100","44.9","44.9","","","","","","50","
150","","*","",""
"TW12D-20200709","537_MOD","07/21/20","22:18","N","NA","000","13C2-PFUnA","13C2-
PFUnA","42.9","","IS","Yes","Y","H","Y","","","","PCT_REC","","","","","100","42.9","42.9","","","","","","50","150"
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"TW12D-20200709","537_MOD","07/21/20","22:18","N","NA","000","d5-EtFOSAA","d5-
EtFOSAA","41.2","","IS","Yes","Y","H","Y","","","","PCT_REC","","","","","100","41.2","41.2","","","","","","50","1
50","","*","",""
"TW12D-20200709","537_MOD","07/21/20","22:18","N","NA","000","13C2-PFDoA","13C2-
PFDoA","24.1","","IS","Yes","Y","H","Y","","","","PCT_REC","","","","","100","24.1","24.1","","","","","","50","150"
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"TW12D-20200709","537_MOD","07/21/20","22:18","N","NA","000","13C2-PFTeDA","13C2-
PFTeDA","5.20","","IS","Yes","Y","H","Y","","","","PCT_REC","","","","","100","5.20","5.20","","","","","","50","15
0","","*","",""
"TW13D-20200709","537_MOD","07/21/20","22:29","N","NA","000","375-73-
5","PFBS","0.290","","TRG","Yes","Y","","Y","0.00130","0.00190","0.00380","UG_L","UG_L","","","","","","","","",
"","","","","","","","",""
"TW13D-20200709","537_MOD","07/21/20","22:29","N","NA","000","307-24-4","PERFLUOROHEXANOIC ACID
(PFHXA)","1.26","","TRG","Yes","Y","","Y","0.00130","0.00190","0.00380","UG_L","UG_L","","","","","","","","","
","","","","","","","",""
"TW13D-20200709","537_MOD","07/21/20","22:29","N","NA","000","13252-13-6","HEXAFLUOROPROPYLENE
OXIDE DIMER ACID (HFPO-
DA)","","","TRG","Yes","N","U","Y","0.00229","0.00285","0.00380","UG_L","UG_L","","","","","","","","","","","
","","","",""
"TW13D-20200709","537_MOD","07/21/20","22:29","N","NA","000","375-85-9","PERFLUOROHEPTANOIC ACID
(PFHPA)","0.254","","TRG","Yes","Y","","Y","0.00130","0.00190","0.00380","UG_L","UG_L","","","","","","","","","
","","","","","","","",""
"TW13D-20200709","537_MOD","07/21/20","22:29","N","NA","000","919005-14-4","4,8-DIOXA-3H-
PERFLUORONONANOIC ACID
(ADONA)","","","TRG","Yes","N","U","Y","0.00130","0.00190","0.00380","UG_L","UG_L","","","","","","","","","",

"","","","","","","","","
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"TW13D-20200709","537_MOD","07/21/20","22:29","N","NA","000","355-46-
4","PERFLUOROHEXANESULFONIC ACID
(PFHXS)","1.47","","TRG","Yes","Y","","Y","0.00130","0.00190","0.00380","UG_L","UG_L","","","","","","","","","","
","","","","","","","","","","
"TW13D-20200709","537_MOD","07/24/20","20:19","N","NA","DL1","335-67-1","PERFLUOROOCTANOIC ACID
(PFOA)","4.22","","TRG","Yes","Y","D","Y","0.00651","0.00951","0.0190","UG_L","UG_L","","","","","","","","","","
","","","","","","","","","
"TW13D-20200709","537_MOD","07/21/20","22:29","N","NA","000","375-95-1","PERFLUORONONANOIC ACID
(PFNA)","0.00245","","TRG","Yes","Y","J,
Q","Y","0.00130","0.00190","0.00380","UG_L","UG_L","
"TW13D-20200709","537_MOD","07/21/20","22:29","N","NA","000","1763-23-
1","HEPTADECAFLUOROACTANESULFONIC ACID SOLUTION
","0.231","","TRG","Yes","Y","","Y","0.00130","0.00190","0.00380","UG_L","UG_L","","","","","","","","","","","","","","","
","","","","","","
"TW13D-20200709","537_MOD","07/21/20","22:29","N","NA","000","756426-58-1","9-
CHLOROHEXADECAFLUORO-3-OXANONE-1-SULFONIC ACID (9Cl-
PF3ONS)","","","TRG","Yes","N","U","Y","0.00130","0.00190","0.00380","UG_L","UG_L","","","","","","","","","","","
","","","","","","","","","
"TW13D-20200709","537_MOD","07/21/20","22:29","N","NA","000","335-76-2","PERFLUORODECANOIC ACID
(PFDA)","","","TRG","Yes","N","U","Y","0.00130","0.00190","0.00380","UG_L","UG_L","","","","","","","","","","","
","","","","","","","","","
"TW13D-20200709","537_MOD","07/21/20","22:29","N","NA","000","2355-31-
9","MeFOSAA","","","TRG","Yes","N","U","Y","0.00130","0.00190","0.00380","UG_L","UG_L","","","","","","","","","","
","","","","","","","","","","
"TW13D-20200709","537_MOD","07/21/20","22:29","N","NA","000","2991-50-
6","EtFOSAA","","","TRG","Yes","N","U","Y","0.00130","0.00190","0.00380","UG_L","UG_L","","","","","","","","","","
","","","","","","","","","","
"TW13D-20200709","537_MOD","07/21/20","22:29","N","NA","000","2058-94-8","PERFLUOROUNDECANOIC
ACID
(PFUNA)","","","TRG","Yes","N","U","Y","0.00130","0.00190","0.00380","UG_L","UG_L","","","","","","","","","","","
","","","","","","","","","
"TW13D-20200709","537_MOD","07/21/20","22:29","N","NA","000","763051-92-9","11-
CHLOROEICOSAFLUORO-3-OXAUNDECANE-1-SULFONIC ACID (11Cl-
PF3OUdS)","","","TRG","Yes","N","U","Y","0.00130","0.00190","0.00380","UG_L","UG_L","","","","","","","","","","","
","","","","","","","","","
"TW13D-20200709","537_MOD","07/21/20","22:29","N","NA","000","307-55-1","PERFLUORODODECANOIC
ACID
(PFDOA)","","","TRG","Yes","N","U","Y","0.00130","0.00190","0.00380","UG_L","UG_L","","","","","","","","","","","
","","","","","","","","","
"TW13D-20200709","537_MOD","07/21/20","22:29","N","NA","000","72629-94-
8","PFTrDA","","","TRG","Yes","N","U","Y","0.00130","0.00190","0.00380","UG_L","UG_L","","","","","","","","","","","
","","","","","","","","","
"TW13D-20200709","537_MOD","07/21/20","22:29","N","NA","000","376-06-
7","PFTeDA","","","TRG","Yes","N","U","Y","0.00130","0.00190","0.00380","UG_L","UG_L","","","","","","","","","","","
","","","","","","","","","
"TW13D-20200709","537_MOD","07/21/20","22:29","N","NA","000","13C3-PFBS","13C3-
PFBS","84.5","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","84.5","84.5","","","","","","50","150","","
","","","
"TW13D-20200709","537_MOD","07/21/20","22:29","N","NA","000","13C3-HFPO-DA","13C3-HFPO-
DA","83.5","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","83.5","83.5","","","","","","50","150","","","
","","
"TW13D-20200709","537_MOD","07/21/20","22:29","N","NA","000","13C2-PFHxA","13C2-
PFHxA","83.0","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","83.0","83.0","","","","","","50","150","

","","",""
"TW13D-20200709","537_MOD","07/21/20","22:29","N","NA","000","13C4-PFHpA","13C4-PFHpA","84.7","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","84.7","84.7","","","","","","50","150","","","",""
"TW13D-20200709","537_MOD","07/21/20","22:29","N","NA","000","13C3-PFHxS","13C3-PFHxS","84.3","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","84.3","84.3","","","","","","50","150","","","",""
"TW13D-20200709","537_MOD","07/21/20","22:29","N","NA","000","13C5-PFNA","13C5-PFNA","88.2","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","88.2","88.2","","","","","","50","150","","","",""
"TW13D-20200709","537_MOD","07/24/20","20:19","N","NA","DL1","13C2-PFOA","13C2-PFOA","100","","IS","Yes","Y","D","Y","","","","PCT_REC","","","","","100","100","100","","","","","","50","150","","","",""
"TW13D-20200709","537_MOD","07/21/20","22:29","N","NA","000","13C8-PFOS","13C8-PFOS","92.8","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","92.8","92.8","","","","","","50","150","","","",""
"TW13D-20200709","537_MOD","07/21/20","22:29","N","NA","000","13C2-PFDA","13C2-PFDA","88.3","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","88.3","88.3","","","","","","50","150","","","",""
"TW13D-20200709","537_MOD","07/21/20","22:29","N","NA","000","d3-MeFOSAA","d3-MeFOSAA","75.1","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","75.1","75.1","","","","","","50","150","","","",""
"TW13D-20200709","537_MOD","07/21/20","22:29","N","NA","000","13C2-PFUnA","13C2-PFUnA","73.0","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","73.0","73.0","","","","","","50","150","","","",""
"TW13D-20200709","537_MOD","07/21/20","22:29","N","NA","000","d5-EtFOSAA","d5-EtFOSAA","70.7","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","70.7","70.7","","","","","","50","150","","","",""
"TW13D-20200709","537_MOD","07/21/20","22:29","N","NA","000","13C2-PFDoA","13C2-PFDoA","52.4","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","52.4","52.4","","","","","","50","150","","","",""
"TW13D-20200709","537_MOD","07/21/20","22:29","N","NA","000","13C2-PFTeDA","13C2-PFTeDA","10.8","","IS","Yes","Y","H","Y","","","","PCT_REC","","","","","100","10.8","10.8","","","","","","50","150","","*","",""
"TW14D-20200709","537_MOD","07/23/20","13:08","N","NA","000","375-73-5","PFBS","0.0328","","TRG","Yes","Y","","Y","0.00133","0.00194","0.00388","UG_L","UG_L","","","","","","","","","","","","","","","","",""
"TW14D-20200709","537_MOD","07/23/20","13:08","N","NA","000","307-24-4","PERFLUOROHEXANOIC ACID (PFHXA)","0.0845","","TRG","Yes","Y","","Y","0.00133","0.00194","0.00388","UG_L","UG_L","","","","","","","","","","","","","","","","",""
"TW14D-20200709","537_MOD","07/23/20","13:08","N","NA","000","13252-13-6","HEXAFLUOROPROPYLENE OXIDE DIMER ACID (HFPO-DA)","","","TRG","Yes","N","U","Y","0.00234","0.00291","0.00388","UG_L","UG_L","","","","","","","","","","","","","","","","",""
"TW14D-20200709","537_MOD","07/23/20","13:08","N","NA","000","375-85-9","PERFLUOROHEPTANOIC ACID (PFHPA)","0.0313","","TRG","Yes","Y","","Y","0.00133","0.00194","0.00388","UG_L","UG_L","","","","","","","","","","","","","","","","",""
"TW14D-20200709","537_MOD","07/23/20","13:08","N","NA","000","919005-14-4","4,8-DIOXA-3H-PERFLUORONONANOIC ACID (ADONA)","","","TRG","Yes","N","U","Y","0.00133","0.00194","0.00388","UG_L","UG_L","","","","","","","","","","","","","","","","",""
"TW14D-20200709","537_MOD","07/23/20","13:08","N","NA","000","355-46-4","PERFLUOROHEXANESULFONIC ACID (PFHXS)","0.153","","TRG","Yes","Y","","Y","0.00133","0.00194","0.00388","UG_L","UG_L","","","","","","","","",""

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","","","","","","","","","","
"TW14D-20200709","537_MOD","07/23/20","13:08","N","NA","000","335-67-1","PERFLUOROOCTANOIC ACID
(PFOA)","0.250","","TRG","Yes","Y","","Y","0.00133","0.00194","0.00388","UG_L","UG_L","","","","","","","","","","
","","","","","","","","","","
"TW14D-20200709","537_MOD","07/23/20","13:08","N","NA","000","375-95-1","PERFLUORONONANOIC ACID
(PFNA)","","","TRG","Yes","N","U","Y","0.00133","0.00194","0.00388","UG_L","UG_L","","","","","","","","","","","
","","","","","","","","","","
"TW14D-20200709","537_MOD","07/23/20","13:08","N","NA","000","1763-23-
1","HEPTADECAFLUOROACTANESULFONIC ACID SOLUTION
","0.0233","","TRG","Yes","Y","","Y","0.00133","0.00194","0.00388","UG_L","UG_L","","","","","","","","","","","","
","","","","","","","","","","
"TW14D-20200709","537_MOD","07/23/20","13:08","N","NA","000","756426-58-1","9-
CHLOROHEXADECAFLUORO-3-OXANONE-1-SULFONIC ACID (9Cl-
PF3ONS)","","","TRG","Yes","N","U","Y","0.00133","0.00194","0.00388","UG_L","UG_L","","","","","","","","","","","
","","","","","","","","","","
"TW14D-20200709","537_MOD","07/23/20","13:08","N","NA","000","335-76-2","PERFLUORODECANOIC ACID
(PFDA)","","","TRG","Yes","N","U","Y","0.00133","0.00194","0.00388","UG_L","UG_L","","","","","","","","","","","
","","","","","","","","","","
"TW14D-20200709","537_MOD","07/23/20","13:08","N","NA","000","2355-31-
9","MeFOSAA","","","TRG","Yes","N","U","Y","0.00133","0.00194","0.00388","UG_L","UG_L","","","","","","","","","","
","","","","","","","","","","
"TW14D-20200709","537_MOD","07/23/20","13:08","N","NA","000","2991-50-
6","EtFOSAA","","","TRG","Yes","N","U","Y","0.00133","0.00194","0.00388","UG_L","UG_L","","","","","","","","","","
","","","","","","","","","","
"TW14D-20200709","537_MOD","07/23/20","13:08","N","NA","000","2058-94-8","PERFLUOROUNDECANOIC
ACID
(PFUNA)","","","TRG","Yes","N","U","Y","0.00133","0.00194","0.00388","UG_L","UG_L","","","","","","","","","","","
","","","","","","","","","","
"TW14D-20200709","537_MOD","07/23/20","13:08","N","NA","000","763051-92-9","11-
CHLOROEICOSAFLUORO-3-OXAUNDECANE-1-SULFONIC ACID (11Cl-
PF3OUdS)","","","TRG","Yes","N","U","Y","0.00133","0.00194","0.00388","UG_L","UG_L","","","","","","","","","","","
","","","","","","","","","","
"TW14D-20200709","537_MOD","07/23/20","13:08","N","NA","000","307-55-1","PERFLUORODODECANOIC
ACID
(PFDOA)","","","TRG","Yes","N","U","Y","0.00133","0.00194","0.00388","UG_L","UG_L","","","","","","","","","","","
","","","","","","","","","","
"TW14D-20200709","537_MOD","07/23/20","13:08","N","NA","000","72629-94-
8","PFTrDA","","","TRG","Yes","N","U","Y","0.00133","0.00194","0.00388","UG_L","UG_L","","","","","","","","","","","
","","","","","","","","","","
"TW14D-20200709","537_MOD","07/23/20","13:08","N","NA","000","376-06-
7","PFTeDA","","","TRG","Yes","N","U","Y","0.00133","0.00194","0.00388","UG_L","UG_L","","","","","","","","","","","
","","","","","","","","","","
"TW14D-20200709","537_MOD","07/23/20","13:08","N","NA","000","13C3-PFBS","13C3-
PFBS","89.7","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","89.7","89.7","","","","","","50","150","","
","","","
"TW14D-20200709","537_MOD","07/23/20","13:08","N","NA","000","13C3-HFPO-DA","13C3-HFPO-
DA","76.1","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","76.1","76.1","","","","","","50","150","","","
","","
"TW14D-20200709","537_MOD","07/23/20","13:08","N","NA","000","13C2-PFHxA","13C2-
PFHxA","79.0","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","79.0","79.0","","","","","","50","150","
","","","","
"TW14D-20200709","537_MOD","07/23/20","13:08","N","NA","000","13C4-PFHpA","13C4-
PFHpA","83.8","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","83.8","83.8","","","","","","50","150","
","","","","

"TW14D-20200709","537_MOD","07/23/20","13:08","N","NA","000","13C3-PFHxS","13C3-PFHxS","86.0","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","86.0","86.0","","","","","","50","150","","","","",""
"TW14D-20200709","537_MOD","07/23/20","13:08","N","NA","000","13C5-PFNA","13C5-PFNA","87.1","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","87.1","87.1","","","","","","50","150","","","","",""
"TW14D-20200709","537_MOD","07/23/20","13:08","N","NA","000","13C2-PFOA","13C2-PFOA","88.9","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","88.9","88.9","","","","","","50","150","","","","",""
"TW14D-20200709","537_MOD","07/23/20","13:08","N","NA","000","13C8-PFOS","13C8-PFOS","74.9","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","74.9","74.9","","","","","","50","150","","","","",""
"TW14D-20200709","537_MOD","07/23/20","13:08","N","NA","000","13C2-PFDA","13C2-PFDA","81.0","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","81.0","81.0","","","","","","50","150","","","","",""
"TW14D-20200709","537_MOD","07/23/20","13:08","N","NA","000","d3-MeFOSAA","d3-MeFOSAA","78.6","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","78.6","78.6","","","","","","50","150","","","","",""
"TW14D-20200709","537_MOD","07/23/20","13:08","N","NA","000","13C2-PFUnA","13C2-PFUnA","69.1","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","69.1","69.1","","","","","","50","150","","","","",""
"TW14D-20200709","537_MOD","07/23/20","13:08","N","NA","000","d5-EtFOSAA","d5-EtFOSAA","60.1","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","60.1","60.1","","","","","","50","150","","","","","",""
"TW14D-20200709","537_MOD","07/23/20","13:08","N","NA","000","13C2-PFDoA","13C2-PFDoA","41.5","","IS","Yes","Y","H","Y","","","","PCT_REC","","","","","100","41.5","41.5","","","","","","50","150","","","*","","",""
"TW14D-20200709","537_MOD","07/23/20","13:08","N","NA","000","13C2-PFTeDA","13C2-PFTeDA","6.60","","IS","Yes","Y","H","Y","","","","PCT_REC","","","","","100","6.60","6.60","","","","","","50","150","","","*","","",""
"B0G0090-BLK1","537_MOD","07/21/20","20:22","N","NA","000","375-73-5","PFBS","","","TRG","Yes","N","U","Y","0.00137","0.00200","0.00400","UG_L","UG_L",""
"B0G0090-BLK1","537_MOD","07/21/20","20:22","N","NA","000","307-24-4","PERFLUOROHEXANOIC ACID (PFHXA)","","","TRG","Yes","N","U","Y","0.00137","0.00200","0.00400","UG_L","UG_L",""
"B0G0090-BLK1","537_MOD","07/21/20","20:22","N","NA","000","13252-13-6","HEXAFLUOROPROPYLENE OXIDE DIMER ACID (HFPO-DA)","","","TRG","Yes","N","U","Y","0.00241","0.00300","0.00400","UG_L","UG_L",""
"B0G0090-BLK1","537_MOD","07/21/20","20:22","N","NA","000","375-85-9","PERFLUOROHEPTANOIC ACID (PFHPA)","","","TRG","Yes","N","U","Y","0.00137","0.00200","0.00400","UG_L","UG_L",""
"B0G0090-BLK1","537_MOD","07/21/20","20:22","N","NA","000","919005-14-4","4,8-DIOXA-3H-PERFLUORONONANOIC ACID (ADONA)","","","TRG","Yes","N","U","Y","0.00137","0.00200","0.00400","UG_L","UG_L",""
"B0G0090-BLK1","537_MOD","07/21/20","20:22","N","NA","000","355-46-4","PERFLUOROHEXANESULFONIC ACID (PFHXS)","","","TRG","Yes","N","U","Y","0.00137","0.00200","0.00400","UG_L","UG_L",""
"B0G0090-BLK1","537_MOD","07/21/20","20:22","N","NA","000","335-67-1","PERFLUOROOCTANOIC ACID (PFOA)","","","TRG","Yes","N","U","Y","0.00137","0.00200","0.00400","UG_L","UG_L",""

"B0G0090-BLK1","537_MOD","07/21/20","20:22","N","NA","000","375-95-1","PERFLUORONONANOIC ACID
(PFNA)","","","TRG","Yes","N","U","Y","0.00137","0.00200","0.00400","UG_L","UG_L","","","","","","","","","","",
"","","","","","",""
"B0G0090-BLK1","537_MOD","07/21/20","20:22","N","NA","000","1763-23-
1","HEPTADECAFLUOROACTANESULFONIC ACID SOLUTION
","","","TRG","Yes","N","U","Y","0.00137","0.00200","0.00400","UG_L","UG_L","","","","","","","","","","","","","","
","","",""
"B0G0090-BLK1","537_MOD","07/21/20","20:22","N","NA","000","756426-58-1","9-
CHLOROHEXADECAFLUORO-3-OXANONE-1-SULFONIC ACID (9Cl-
PF3ONS)","","","TRG","Yes","N","U","Y","0.00137","0.00200","0.00400","UG_L","UG_L","","","","","","","","","","
","","","","","","",""
"B0G0090-BLK1","537_MOD","07/21/20","20:22","N","NA","000","335-76-2","PERFLUORODECANOIC ACID
(PFDA)","","","TRG","Yes","N","U","Y","0.00137","0.00200","0.00400","UG_L","UG_L","","","","","","","","","","",
"","","","","","",""
"B0G0090-BLK1","537_MOD","07/21/20","20:22","N","NA","000","2355-31-
9","MeFOSAA","","","TRG","Yes","N","U","Y","0.00137","0.00200","0.00400","UG_L","UG_L","","","","","","","","
","","","","","","","","",""
"B0G0090-BLK1","537_MOD","07/21/20","20:22","N","NA","000","2991-50-
6","EtFOSAA","","","TRG","Yes","N","U","Y","0.00137","0.00200","0.00400","UG_L","UG_L","","","","","","","","",
"","","","","","","","",""
"B0G0090-BLK1","537_MOD","07/21/20","20:22","N","NA","000","2058-94-8","PERFLUOROUNDECANOIC
ACID
(PFUNA)","","","TRG","Yes","N","U","Y","0.00137","0.00200","0.00400","UG_L","UG_L","","","","","","","","","","
","","","","","","",""
"B0G0090-BLK1","537_MOD","07/21/20","20:22","N","NA","000","763051-92-9","11-CHLOROEICOSAFLUORO-
3-OXAUNDECANE-1-SULFONIC ACID (11Cl-
PF3OUdS)","","","TRG","Yes","N","U","Y","0.00137","0.00200","0.00400","UG_L","UG_L","","","","","","","","","",
"","","","","","","",""
"B0G0090-BLK1","537_MOD","07/21/20","20:22","N","NA","000","307-55-1","PERFLUORODODECANOIC ACID
(PFDOA)","","","TRG","Yes","N","U","Y","0.00137","0.00200","0.00400","UG_L","UG_L","","","","","","","","","","
","","","","","","",""
"B0G0090-BLK1","537_MOD","07/21/20","20:22","N","NA","000","72629-94-
8","PFTrDA","","","TRG","Yes","N","U","Y","0.00137","0.00200","0.00400","UG_L","UG_L","","","","","","","","","
","","","","","","","",""
"B0G0090-BLK1","537_MOD","07/21/20","20:22","N","NA","000","376-06-
7","PFTeDA","","","TRG","Yes","N","U","Y","0.00137","0.00200","0.00400","UG_L","UG_L","","","","","","","","","
","","","","","","","",""
"B0G0090-BLK1","537_MOD","07/21/20","20:22","N","NA","000","13C3-PFBS","13C3-
PFBS","92.9","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","92.9","92.9","","","","","","50","150","",
"","",""
"B0G0090-BLK1","537_MOD","07/21/20","20:22","N","NA","000","13C3-HFPO-DA","13C3-HFPO-
DA","75.6","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","75.6","75.6","","","","","","50","150","",""
,"",""
"B0G0090-BLK1","537_MOD","07/21/20","20:22","N","NA","000","13C2-PFHxA","13C2-
PFHxA","88.1","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","88.1","88.1","","","","","","50","150","
","","",""
"B0G0090-BLK1","537_MOD","07/21/20","20:22","N","NA","000","13C4-PFHpA","13C4-
PFHpA","88.1","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","88.1","88.1","","","","","","50","150","
","","",""
"B0G0090-BLK1","537_MOD","07/21/20","20:22","N","NA","000","13C3-PFHxS","13C3-
PFHxS","102","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","102","102","","","","","","50","150","",
"","",""
"B0G0090-BLK1","537_MOD","07/21/20","20:22","N","NA","000","13C5-PFNA","13C5-
PFNA","94.3","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","94.3","94.3","","","","","","50","150",""

,"","","",""
"B0G0090-BLK1","537_MOD","07/21/20","20:22","N","NA","000","13C2-PFOA","13C2-PFOA","88.1","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","88.1","88.1","","","","","","50","150","","","","",""
"B0G0090-BLK1","537_MOD","07/21/20","20:22","N","NA","000","13C8-PFOS","13C8-PFOS","91.1","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","91.1","91.1","","","","","","50","150","","","","",""
"B0G0090-BLK1","537_MOD","07/21/20","20:22","N","NA","000","13C2-PFDA","13C2-PFDA","84.5","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","84.5","84.5","","","","","","50","150","","","","",""
"B0G0090-BLK1","537_MOD","07/21/20","20:22","N","NA","000","d3-MeFOSAA","d3-MeFOSAA","80.2","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","80.2","80.2","","","","","","50","150","","","","",""
"B0G0090-BLK1","537_MOD","07/21/20","20:22","N","NA","000","13C2-PFUnA","13C2-PFUnA","77.3","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","77.3","77.3","","","","","","50","150","","","","",""
"B0G0090-BLK1","537_MOD","07/21/20","20:22","N","NA","000","d5-EtFOSAA","d5-EtFOSAA","81.3","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","81.3","81.3","","","","","","50","150","","","","","",""
"B0G0090-BLK1","537_MOD","07/21/20","20:22","N","NA","000","13C2-PFDoA","13C2-PFDoA","80.0","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","80.0","80.0","","","","","","50","150","","","","",""
"B0G0090-BLK1","537_MOD","07/21/20","20:22","N","NA","000","13C2-PFTeDA","13C2-PFTeDA","76.4","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","76.4","76.4","","","","","","50","150","","","","",""
"B0G0090-BS1","537_MOD","07/21/20","20:32","N","NA","000","375-73-5","PFBS","0.0413","","TRG","Yes","Y","","Y","0.00137","0.00200","0.00400","UG_L","UG_L","","","","0.0400","0.0413","103","","","","","","72","130","","","","",""
"B0G0090-BS1","537_MOD","07/21/20","20:32","N","NA","000","307-24-4","PERFLUOROHEXANOIC ACID (PFHXA)","0.0411","","TRG","Yes","Y","","Y","0.00137","0.00200","0.00400","UG_L","UG_L","","","","0.0400","0.0411","103","","","","","","72","129","","","","",""
"B0G0090-BS1","537_MOD","07/21/20","20:32","N","NA","000","13252-13-6","HEXAFLUOROPROPYLENE OXIDE DIMER ACID (HFPO-DA)","0.0388","","TRG","Yes","Y","","Y","0.00241","0.00300","0.00400","UG_L","UG_L","","","","0.0400","0.0388","96.9","","","","","","","70","130","","","","",""
"B0G0090-BS1","537_MOD","07/21/20","20:32","N","NA","000","375-85-9","PERFLUOROHEPTANOIC ACID (PFHPA)","0.0392","","TRG","Yes","Y","","Y","0.00137","0.00200","0.00400","UG_L","UG_L","","","","0.0400","0.0392","98.0","","","","","","","72","130","","","","",""
"B0G0090-BS1","537_MOD","07/21/20","20:32","N","NA","000","919005-14-4","4,8-DIOXA-3H-PERFLUORONONANOIC ACID (ADONA)","0.0401","","TRG","Yes","Y","","Y","0.00137","0.00200","0.00400","UG_L","UG_L","","","","0.0400","0.0401","100","","","","","","","70","130","","","","",""
"B0G0090-BS1","537_MOD","07/21/20","20:32","N","NA","000","355-46-4","PERFLUOROHEXANESULFONIC ACID (PFHXS)","0.0410","","TRG","Yes","Y","","Y","0.00137","0.00200","0.00400","UG_L","UG_L","","","","0.0400","0.0410","103","","","","","","68","131","","","","",""
"B0G0090-BS1","537_MOD","07/21/20","20:32","N","NA","000","335-67-1","PERFLUOROOCTANOIC ACID (PFOA)","0.0381","","TRG","Yes","Y","","Y","0.00137","0.00200","0.00400","UG_L","UG_L","","","","0.0400","0.0381","95.3","","","","","","","71","133","","","","",""
"B0G0090-BS1","537_MOD","07/21/20","20:32","N","NA","000","375-95-1","PERFLUORONONANOIC ACID (PFNA)","0.0385","","TRG","Yes","Y","","Y","0.00137","0.00200","0.00400","UG_L","UG_L","","","","0.0400","0.0385","96.2","","","","","","","69","130","","","","",""
"B0G0090-BS1","537_MOD","07/21/20","20:32","N","NA","000","1763-23-1","HEPTADECAFLUOROACTANESULFONIC ACID SOLUTION

","0.0417","","TRG","Yes","Y","","Y","0.00137","0.00200","0.00400","UG_L","UG_L","","","","0.0400","0.0417","104","","","","","","","65","140","","","","",""
"B0G0090-BS1","537_MOD","07/21/20","20:32","N","NA","000","756426-58-1","9-CHLOROHEXADECAFLUORO-3-OXANONE-1-SULFONIC ACID (9Cl-PF3ONS)","0.0383","","TRG","Yes","Y","","Y","0.00137","0.00200","0.00400","UG_L","UG_L","","","","0.0400","0.0383","95.7","","","","","","","70","130","","","","",""
"B0G0090-BS1","537_MOD","07/21/20","20:32","N","NA","000","335-76-2","PERFLUORODECANOIC ACID (PFDA)","0.0419","","TRG","Yes","Y","","Y","0.00137","0.00200","0.00400","UG_L","UG_L","","","","0.0400","0.0419","105","","","","","","","71","129","","","","",""
"B0G0090-BS1","537_MOD","07/21/20","20:32","N","NA","000","2355-31-9","MeFOSAA","0.0408","","TRG","Yes","Y","","Y","0.00137","0.00200","0.00400","UG_L","UG_L","","","","0.0400","0.0408","102","","","","","","","65","136","","","","",""
"B0G0090-BS1","537_MOD","07/21/20","20:32","N","NA","000","2991-50-6","EtFOSAA","0.0473","","TRG","Yes","Y","","Y","0.00137","0.00200","0.00400","UG_L","UG_L","","","","0.0400","0.0473","118","","","","","","","61","135","","","","",""
"B0G0090-BS1","537_MOD","07/21/20","20:32","N","NA","000","2058-94-8","PERFLUOROUNDECANOIC ACID (PFUNA)","0.0379","","TRG","Yes","Y","","Y","0.00137","0.00200","0.00400","UG_L","UG_L","","","","0.0400","0.0379","94.7","","","","","","","69","133","","","","",""
"B0G0090-BS1","537_MOD","07/21/20","20:32","N","NA","000","763051-92-9","11-CHLOROEICOSAFLUORO-3-OXAUNDECANE-1-SULFONIC ACID (11Cl-PF3OUdS)","0.0402","","TRG","Yes","Y","","Y","0.00137","0.00200","0.00400","UG_L","UG_L","","","","0.0400","0.0402","100","","","","","","","70","130","","","","",""
"B0G0090-BS1","537_MOD","07/21/20","20:32","N","NA","000","307-55-1","PERFLUORODODECANOIC ACID (PFDOA)","0.0394","","TRG","Yes","Y","","Y","0.00137","0.00200","0.00400","UG_L","UG_L","","","","0.0400","0.0394","98.5","","","","","","","72","134","","","","",""
"B0G0090-BS1","537_MOD","07/21/20","20:32","N","NA","000","72629-94-8","PFTrDA","0.0412","","TRG","Yes","Y","","Y","0.00137","0.00200","0.00400","UG_L","UG_L","","","","0.0400","0.0412","103","","","","","","","65","144","","","","",""
"B0G0090-BS1","537_MOD","07/21/20","20:32","N","NA","000","376-06-7","PFTeDA","0.0409","","TRG","Yes","Y","","Y","0.00137","0.00200","0.00400","UG_L","UG_L","","","","0.0400","0.0409","102","","","","","","","71","132","","","","",""
"B0G0090-BS1","537_MOD","07/21/20","20:32","N","NA","000","13C3-PFBS","13C3-PFBS","87.5","","IS","Yes","Y","","Y","","","","","PCT_REC","","","","","100","87.5","87.5","","","","","","50","150","","","","",""
"B0G0090-BS1","537_MOD","07/21/20","20:32","N","NA","000","13C3-HFPO-DA","13C3-HFPO-DA","79.2","","IS","Yes","Y","","Y","","","","","PCT_REC","","","","","100","79.2","79.2","","","","","","50","150","","","","",""
"B0G0090-BS1","537_MOD","07/21/20","20:32","N","NA","000","13C2-PFHxA","13C2-PFHxA","80.7","","IS","Yes","Y","","Y","","","","","PCT_REC","","","","","100","80.7","80.7","","","","","","50","150","","","","",""
"B0G0090-BS1","537_MOD","07/21/20","20:32","N","NA","000","13C4-PFHpA","13C4-PFHpA","83.4","","IS","Yes","Y","","Y","","","","","PCT_REC","","","","","100","83.4","83.4","","","","","","50","150","","","","",""
"B0G0090-BS1","537_MOD","07/21/20","20:32","N","NA","000","13C3-PFHxS","13C3-PFHxS","93.0","","IS","Yes","Y","","Y","","","","","PCT_REC","","","","","100","93.0","93.0","","","","","","50","150","","","","",""
"B0G0090-BS1","537_MOD","07/21/20","20:32","N","NA","000","13C5-PFNA","13C5-PFNA","91.4","","IS","Yes","Y","","Y","","","","","PCT_REC","","","","","100","91.4","91.4","","","","","","50","150","","","","",""
"B0G0090-BS1","537_MOD","07/21/20","20:32","N","NA","000","13C2-PFOA","13C2-PFOA","86.5","","IS","Yes","Y","","Y","","","","","PCT_REC","","","","","100","86.5","86.5","","","","","","50","150","","","","",""
"B0G0090-BS1","537_MOD","07/21/20","20:32","N","NA","000","13C8-PFOS","13C8-PFOS","83.3","","IS","Yes","Y","","Y","","","","","PCT_REC","","","","","100","83.3","83.3","","","","","","50","150","",

"","","",""
"B0G0090-BS1","537_MOD","07/21/20","20:32","N","NA","000","13C2-PFDA","13C2-PFDA","84.0","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","84.0","84.0","","","","","","50","150","","","","",""
"B0G0090-BS1","537_MOD","07/21/20","20:32","N","NA","000","d3-MeFOSAA","d3-MeFOSAA","70.9","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","70.9","70.9","","","","","","50","150","","","","",""
"B0G0090-BS1","537_MOD","07/21/20","20:32","N","NA","000","13C2-PFUnA","13C2-PFUnA","73.0","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","73.0","73.0","","","","","","50","150","","","","",""
"B0G0090-BS1","537_MOD","07/21/20","20:32","N","NA","000","d5-EtFOSAA","d5-EtFOSAA","65.6","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","65.6","65.6","","","","","","50","150","","","","",""
"B0G0090-BS1","537_MOD","07/21/20","20:32","N","NA","000","13C2-PFDoA","13C2-PFDoA","69.4","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","69.4","69.4","","","","","","50","150","","","","",""
"B0G0090-BS1","537_MOD","07/21/20","20:32","N","NA","000","13C2-PFTeDA","13C2-PFTeDA","71.5","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","71.5","71.5","","","","","","50","150","","","","",""
"B0G0090-BSD1","537_MOD","07/21/20","20:43","N","NA","000","375-73-5","PFBS","0.0386","","TRG","Yes","Y","","Y","0.00137","0.00200","0.00400","UG_L","UG_L","","","","0.0400","0.0386","96.5","","","","","6.84","72","130","","","","",""
"B0G0090-BSD1","537_MOD","07/21/20","20:43","N","NA","000","307-24-4","PERFLUOROHEXANOIC ACID (PFHXA)","0.0395","","TRG","Yes","Y","","Y","0.00137","0.00200","0.00400","UG_L","UG_L","","","","0.0400","0.0395","98.7","","","","","3.97","72","129","","","","",""
"B0G0090-BSD1","537_MOD","07/21/20","20:43","N","NA","000","13252-13-6","HEXAFLUOROPROPYLENE OXIDE DIMER ACID (HFPO-DA)","0.0379","","TRG","Yes","Y","","Y","0.00241","0.00300","0.00400","UG_L","UG_L","","","","0.0400","0.0379","94.8","","","","","2.25","70","130","","","","",""
"B0G0090-BSD1","537_MOD","07/21/20","20:43","N","NA","000","375-85-9","PERFLUOROHEPTANOIC ACID (PFHPA)","0.0390","","TRG","Yes","Y","","Y","0.00137","0.00200","0.00400","UG_L","UG_L","","","","0.0400","0.0390","97.6","","","","","0.406","72","130","","","","",""
"B0G0090-BSD1","537_MOD","07/21/20","20:43","N","NA","000","919005-14-4","4,8-DIOXA-3H-PERFLUORONONANOIC ACID (ADONA)","0.0375","","TRG","Yes","Y","","Y","0.00137","0.00200","0.00400","UG_L","UG_L","","","","0.0400","0.0375","93.8","","","","","6.63","70","130","","","","",""
"B0G0090-BSD1","537_MOD","07/21/20","20:43","N","NA","000","355-46-4","PERFLUOROHEXANESULFONIC ACID (PFHXS)","0.0377","","TRG","Yes","Y","","Y","0.00137","0.00200","0.00400","UG_L","UG_L","","","","0.0400","0.0377","94.4","","","","","8.33","68","131","","","","",""
"B0G0090-BSD1","537_MOD","07/21/20","20:43","N","NA","000","335-67-1","PERFLUOROOCTANOIC ACID (PFOA)","0.0380","","TRG","Yes","Y","","Y","0.00137","0.00200","0.00400","UG_L","UG_L","","","","0.0400","0.0380","94.9","","","","","0.339","71","133","","","","",""
"B0G0090-BSD1","537_MOD","07/21/20","20:43","N","NA","000","375-95-1","PERFLUORONONANOIC ACID (PFNA)","0.0370","","TRG","Yes","Y","","Y","0.00137","0.00200","0.00400","UG_L","UG_L","","","","0.0400","0.0370","92.6","","","","","3.81","69","130","","","","",""
"B0G0090-BSD1","537_MOD","07/21/20","20:43","N","NA","000","1763-23-1","HEPTADECAFLUOROACTANESULFONIC ACID SOLUTION","0.0357","","TRG","Yes","Y","","Y","0.00137","0.00200","0.00400","UG_L","UG_L","","","","0.0400","0.0357","89.2","","","","","15.6","65","140","","","","",""
"B0G0090-BSD1","537_MOD","07/21/20","20:43","N","NA","000","756426-58-1","9-CHLOROHEXADECAFLUORO-3-OXANONE-1-SULFONIC ACID (9Cl-PF3ONS)","0.0349","","TRG","Yes","Y","","Y","0.00137","0.00200","0.00400","UG_L","UG_L","","","","0.0400","0.0349","87.2","","","","","9.39","70","130","","","","",""

"B0G0090-BSD1","537_MOD","07/21/20","20:43","N","NA","000","335-76-2","PERFLUORODECANOIC ACID (PFDA)","0.0404","","TRG","Yes","Y","","Y","0.00137","0.00200","0.00400","UG_L","UG_L","","","","0.0400","0.0404","101","","","","","","3.59","71","129","","","",""
"B0G0090-BSD1","537_MOD","07/21/20","20:43","N","NA","000","2355-31-9","MeFOSAA","0.0383","","TRG","Yes","Y","","Y","0.00137","0.00200","0.00400","UG_L","UG_L","","","","0.0400","0.0383","95.8","","","","","","6.41","65","136","","","",""
"B0G0090-BSD1","537_MOD","07/21/20","20:43","N","NA","000","2991-50-6","EtFOSAA","0.0381","","TRG","Yes","Y","","Y","0.00137","0.00200","0.00400","UG_L","UG_L","","","","0.0400","0.0381","95.2","","","","","","21.5","61","135","","","",""
"B0G0090-BSD1","537_MOD","07/21/20","20:43","N","NA","000","2058-94-8","PERFLUOROUNDECANOIC ACID (PFUNA)","0.0388","","TRG","Yes","Y","","Y","0.00137","0.00200","0.00400","UG_L","UG_L","","","","0.0400","0.0388","97.1","","","","","","2.52","69","133","","","",""
"B0G0090-BSD1","537_MOD","07/21/20","20:43","N","NA","000","763051-92-9","11-CHLOROEICOSAFLUORO-3-OXAUNDECANE-1-SULFONIC ACID (11Cl-PF3OUdS)","0.0382","","TRG","Yes","Y","","Y","0.00137","0.00200","0.00400","UG_L","UG_L","","","","0.0400","0.0382","95.4","","","","","","5.22","70","130","","","",""
"B0G0090-BSD1","537_MOD","07/21/20","20:43","N","NA","000","307-55-1","PERFLUORODODECANOIC ACID (PFDOA)","0.0376","","TRG","Yes","Y","","Y","0.00137","0.00200","0.00400","UG_L","UG_L","","","","0.0400","0.0376","93.9","","","","","","4.77","72","134","","","",""
"B0G0090-BSD1","537_MOD","07/21/20","20:43","N","NA","000","72629-94-8","PFTrDA","0.0407","","TRG","Yes","Y","","Y","0.00137","0.00200","0.00400","UG_L","UG_L","","","","0.0400","0.0407","102","","","","","","1.23","65","144","","","",""
"B0G0090-BSD1","537_MOD","07/21/20","20:43","N","NA","000","376-06-7","PFTeDA","0.0377","","TRG","Yes","Y","","Y","0.00137","0.00200","0.00400","UG_L","UG_L","","","","0.0400","0.0377","94.3","","","","","","8.06","71","132","","","",""
"B0G0090-BSD1","537_MOD","07/21/20","20:43","N","NA","000","13C3-PFBS","13C3-PFBS","92.6","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","92.6","92.6","","","","","","50","150","","","","",""
"B0G0090-BSD1","537_MOD","07/21/20","20:43","N","NA","000","13C3-HFPO-DA","13C3-HFPO-DA","83.4","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","83.4","83.4","","","","","","50","150","","","","",""
"B0G0090-BSD1","537_MOD","07/21/20","20:43","N","NA","000","13C2-PFHxA","13C2-PFHxA","82.1","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","82.1","82.1","","","","","","50","150","","","","",""
"B0G0090-BSD1","537_MOD","07/21/20","20:43","N","NA","000","13C4-PFHpA","13C4-PFHpA","89.0","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","89.0","89.0","","","","","","50","150","","","","",""
"B0G0090-BSD1","537_MOD","07/21/20","20:43","N","NA","000","13C3-PFHxS","13C3-PFHxS","104","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","104","104","","","","","","50","150","","","","",""
"B0G0090-BSD1","537_MOD","07/21/20","20:43","N","NA","000","13C5-PFNA","13C5-PFNA","93.8","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","93.8","93.8","","","","","","50","150","","","","",""
"B0G0090-BSD1","537_MOD","07/21/20","20:43","N","NA","000","13C2-PFOA","13C2-PFOA","89.8","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","89.8","89.8","","","","","","50","150","","","","",""
"B0G0090-BSD1","537_MOD","07/21/20","20:43","N","NA","000","13C8-PFOS","13C8-PFOS","93.2","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","93.2","93.2","","","","","","50","150","","","","",""
"B0G0090-BSD1","537_MOD","07/21/20","20:43","N","NA","000","13C2-PFDA","13C2-PFDA","84.1","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","84.1","84.1","","","","","","50","150","","","","",""
"B0G0090-BSD1","537_MOD","07/21/20","20:43","N","NA","000","d3-MeFOSAA","d3-

MeFOSAA","74.0","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","74.0","74.0","","","","","","50","150","","","","",""
"B0G0090-BSD1","537_MOD","07/21/20","20:43","N","NA","000","13C2-PFUnA","13C2-PFUnA","76.5","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","76.5","76.5","","","","","","50","150","","","","",""
"B0G0090-BSD1","537_MOD","07/21/20","20:43","N","NA","000","d5-EtFOSAA","d5-EtFOSAA","78.9","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","78.9","78.9","","","","","","50","150","","","","","",""
"B0G0090-BSD1","537_MOD","07/21/20","20:43","N","NA","000","13C2-PFDoA","13C2-PFDoA","76.4","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","76.4","76.4","","","","","","50","150","","","","",""
"B0G0090-BSD1","537_MOD","07/21/20","20:43","N","NA","000","13C2-PFTeDA","13C2-PFTeDA","77.9","","IS","Yes","Y","","Y","","","","PCT_REC","","","","","100","77.9","77.9","","","","","","50","150","","","","",""

LABORATORY DATA CONSULTANTS, INC.
2701 Loker Ave. West, Suite 220, Carlsbad, CA 92010 Bus: 760-827-1100 Fax: 760-827-1099

Wood Environment & Infrastructure Solutions, Inc.
7376 SW Durham Road
Portland, OR 97224
Attn: Ms. Kimberly Shiroodi
Kimberly.Shiroodi@woodplc.com

September 3, 2020

SUBJECT: Revised MCAS El Toro & Tustin PFAs, Data Validation

Dear Ms. Shiroodi,

Enclosed are the revised validation reports for the fraction listed below. These SDGs were received on August 4th and 19th, 2020. Attachment 1 is a summary of the samples that were reviewed for each analysis.

LDC Project #48792_RV2:

SDG #	Fraction
2001357, 2001409, 2001417 2001436, 2001444, 2001472	Perfluoroalkyl & Polyfluoroalkyl Substances

The data validation was performed under Stage 4 guidelines. The analyses were validated using the following documents, as applicable to each method:

- Final Sampling and Analysis Plan for Per- and Polyfluoroalkyl Substances in Groundwater in Carve-Outs 2,5,6 and 9 and Groundwater and Surface Water Near Operable Unit 3, Former Marine Corps Air Station Tustin, Tustin, California with Addendum #02 to Final Sampling and Analysis Plan for Per- and Polyfluoroalkyl Substances Sampling for Groundwater Remedial Action at Operable Unit 3, Installation Restoration Program Site 1; February 2020
- U.S. Department of Defense Quality Systems Manual for Environmental Laboratories, Version 5.3, 2019
- DoD General Validation Guidelines, February 2018

Please feel free to contact us if you have any questions.

Sincerely,

Pei Geng

Pei Geng
Pgeng@lab-data.com
Project Manager/Senior Chemist

167 pages-ADV (100% Stage 4 for this job) (RV-F added) Attachment 1

Stage 2B/4 - do not validate QC samples **LDC #48792 (Wood/KMEA - National City, CA / MCAS El Toro & Tustin PFAs)** **PO001184**

LDC	SDG#	DATE REC'D	(2) DATE DUE	PFAs (537M/ QSM 5.3)																															
Matrix: Water/Soil				W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S
A	2001357	08/04/20	08/18/20	2	0																														
B	2001409	08/04/20	08/18/20	12	0																														
C	2001417	08/04/20	08/18/20	4	0																														
D	2001436	08/04/20	08/18/20	6	0																														
E	2001444	08/04/20	08/18/20	7	0																														
F	2001472	08/19/20	09/02/20	4	0																														
Total	J/PG			35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	35

Shaded cells indicate Stage 4 validation (all other cells are Stage 2B validation). These sample counts do not include MS/MSD, and DUPs

L:\Wood Environmental\El Toro\48792ST.wpd

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: MCAS El Toro and Tustin PFAS

LDC Report Date: August 25, 2020

Parameters: Perfluoroalkyl & Polyfluoroalkyl Substances

Validation Level: Stage 4

Laboratory: Vista Analytical Laboratory

Sample Delivery Group (SDG): 2001357

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
I006MW06S-20200624	2001357-03	Water	06/24/20
DUP01-20200624	2001357-04	Water	06/24/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Sampling and Analysis Plan for Per- and Polyfluoroalkyl Substances in Groundwater in Carve-Outs 2, 5, 6, and 9 and Groundwater and Surface Water Near Operable Unit 3, Former Marine Corps Air Station Tustin, Tustin, California, with Addendum #02 to Final Sampling and Analysis Plan for Per- and Polyfluoroalkyl Substances Sampling for Groundwater Remedial Action at Operable Unit 3, Installation Restoration Program Site 1 (February 2020), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), and the DoD General Validation Guidelines (February 2018). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS) by Environmental Protection Agency (EPA) Method 537 Modified and LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. LC/MS Instrument Performance Check

Instrument performance was checked and the requirements were met.

III. Initial Calibration and Initial Calibration Verification

Initial calibration was performed as required by the methods.

A curve fit, based on the initial calibration, was established for quantitation. The coefficient of determination (r^2) was greater than or equal to 0.990.

For each calibration standard, all compounds were within 70-130% of their true value.

The signal to noise (S/N) ratio was within validation criteria for all compounds.

Retention time windows were established as required by the methods.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds.

IV. Continuing Calibration and Instrument Sensitivity Check

Continuing calibration was performed at required frequencies.

The percent differences (%D) were less than or equal to 30.0% for all compounds.

The signal to noise (S/N) ratio was within validation criteria for all compounds.

The percent differences (%D) of the instrument sensitivity check (ISC) were less than or equal to 30.0% for all compounds.

Retention times of all compounds in the calibration standards were within the established retention time windows.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample EB01-20200624 was identified as an equipment blank. No contaminants were found.

Sample SB01-20200624 was identified as a source blank. No contaminants were found.

VII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VIII. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Field Duplicates

Samples I006MW06S-20200624 and DUP01-20200624 were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Compound	Concentration (ug/L)		RPD (Limits)	Difference (Limits)	Flag	A or P
	222MW09D-20200701	DUP02-20200701				
PFBS	0.0819	0.0824	1 (≤30)	-	-	-
PFHxA	0.6050	0.5880	3 (≤30)	-	-	-
PFHpA	0.3370	0.339	1 (≤30)	-	-	-
PFHxS	0.5150	0.5350	4 (≤30)	-	-	-
PFOA	0.2680	0.3150	16 (≤30)	-	-	-
PFNA	0.0044	0.0049	-	0.00049 (≤0.00394)	-	-
PFOS	0.0906	0.1060	16 (≤30)	-	-	-

X. Labeled Compounds

All percent recoveries (%R) for labeled compounds used to quantitate target compounds were within QC limits.

XI. Compound Quantitation

All compound quantitations met validation criteria.

XII. Target Compound Identifications

All target compound identifications met validation criteria.

XIII. System Performance

The system performance was acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable.

MCAS El Toro and Tustin PFAS
Perfluoroalkyl & Polyfluoroalkyl Substances - Data Qualification Summary - SDG 2001357

No Sample Data Qualified in this SDG

MCAS El Toro and Tustin PFAS
Perfluoroalkyl & Polyfluoroalkyl Substances - Laboratory Blank Data Qualification Summary - SDG 2001357

No Sample Data Qualified in this SDG

MCAS El Toro and Tustin PFAS
Perfluoroalkyl & Polyfluoroalkyl Substances - Field Blank Data Qualification Summary - SDG 2001357

No Sample Data Qualified in this SDG

LDC #: 48792A96 **VALIDATION COMPLETENESS WORKSHEET** Date: 8/14/20

SDG #: 2001357 Stage 4 Page: 1 of 1

Laboratory: Vista Analytical Laboratory Reviewer:

2nd Reviewer:

METHOD: LC/MS Perfluoroalkyl & Polyfluoroalkyl Substances (EPA Method 537M/QSM 5.3 Table B-15)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	LC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / A	r ≥ 0.99 |%D| ≤ 30
IV.	Continuing calibration/ISC	A / A	%D ≤ 30
V.	Laboratory Blanks	A	
VI.	Field blanks	ND	SB01-20200624 EB01-20200624
VII.	Matrix spike/Matrix spike duplicates	N	
VIII.	Laboratory control samples	A	LCS/D
IX.	Field duplicates	SW	D= 1+2
X.	Labeled Compounds	A	
VI.	Compound quantitation RL/LOQ/LODs	A	
XII.	Target compound identification	A	
XIII.	System performance	A	
XIV.	Overall assessment of data	A	

Note: A = Acceptable ND = No compounds detected D = Duplicate SB=Source blank
N = Not provided/applicable R = Rinsate TB = Trip blank OTHER:
SW = See worksheet FB = Field blank EB = Equipment blank

	Client ID	Lab ID	Matrix	Date
1	I006MW06S-20200624	2001357-03	Water	06/24/20
2	DUP01-20200624	2001357-04	Water	06/24/20
3				
4				
5				
6				
7				
8				
9				
10				

Notes:

	BDF0257						

LDC #: 48792A90

VALIDATION FINDINGS CHECKLIST

Reviewer:
2nd Reviewer:

Method: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Were cooler temperature criteria met?	✓			
II. LC/MS Instrument performance check				
Were the instrument performance reviewed and found to be within the validation criteria?	✓			
III. Initial calibration and Initial calibration verification				
Did the laboratory perform a 5-point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) $\leq$ 20%?			✓	
Was a curve fit used for evaluation? If yes, did the initial calibration meet the coefficient of determination (r^2) criteria of $\geq$ 0.990?	✓			
Were all analytes within 70-130% or percent differences (%D) $\leq$30% of their true value for each calibration standard?	✓			
Was the signal to noise (S/N) ratio for all compounds within the validation criteria?	✓			
Were the retention time windows properly established?	✓			
Was an initial calibration verification (ICV) standard analyzed after each initial calibration for each instrument?	✓			
Were all ICV percent differences (%D) of the initial calibration verification $\leq$ 30%?	✓			
IV. Continuing calibration and Instrument sensitivity check				
Was a continuing calibration analyzed prior to sample analysis, after every 10 samples and at the end of the analytical sequence?	✓			
Were all percent differences (%D) of the continuing calibration $\leq$ 30%?	✓			
Were all the retention times within the acceptance windows?	✓			
Was the signal to noise (S/N) ratio for all compounds within the validation criteria?	✓			
Were all percent differences (%D) of the Instrument Sensitivity Check $\leq$ 30%?	✓			
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks?		✓		
VI. Field blanks				
Were field blanks identified in this SDG?	✓			
Were target compounds detected in the field blanks?		✓		

LDC #: 48792A96

VALIDATION FINDINGS CHECKLIST

Reviewer: [illegible]
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VII. Matrix spike/Matrix spike duplicates				
Were matrix spike (MS) and matrix spike duplicate (MSD) analyzed in this SDG?		✓		
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
VIII. Laboratory control samples				
Was an LCS analyzed per extraction batch for this SDG?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
IX. Field duplicates				
Were field duplicate pairs identified in this SDG?	✓			
Were target compounds detected in the field duplicates?	✓			
X. Labeled compounds				
Were labeled compound percent recoveries (%R) within the QC limits?	✓			
Were retention times within 0.4 minutes of the associated calibration standard?	✓			
XI. Compound quantitation				
Did the laboratory reporting limits (i.e. DL, LOD, LOQ) meet the QAPP?	✓			
Did reported results include both branched and linear isomers?	✓			
Were the correct ion transition, labeled compound and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound retention times within 0.1 minutes of the associated labeled compound for compounds with a labeled analog?	✓			
Were compound quantitation and reporting limits adjusted to reflect all sample dilutions and dry weight factors applicable to Stage 4 validation?	✓			
XII. Target compound identification				
Was the signal to noise (S/N) ratio for all compounds within the validation criteria?	✓			
Were two transitions and the ion transition ratio per analyte monitored and documented with the exception of PFBA and PFPeA?	✓			
Were ion ratios between 50-150%?	✓			
XIII. System performance				
System performance was found to be acceptable.	✓			
XIV. Overall assessment of Data				
Overall assessment of data was found to be acceptable.	✓			

TARGET COMPOUND WORKSHEET

METHOD: PFAS

A. PFBS		
B. PFHxA		
C. PFHpA		
D. PFHxS		
E. PFOA		
F. PFNA		
G. PFOS		
H. PFDA		
I. MeFOSAA		
J. EtFOSAA		
K. PFUnA		
L. PFDoA		
M. PFTrDA		
N. PFTeDA		
O. HFPO-DA		
P. ADONA		
Q. 9Cl-PF3ØNS		
R. 11Cl-PF3ØUdS		

LDC #: 48792A96

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: SC
2nd Reviewer:

Method: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

Compound	Concentration (ug/L)		RPD≤30	Difference (<5XLOQ)	Difference (<LOQ)	Qualification
	1	2				
A	0.0819	0.0824	1			
B	0.6050	0.5880	3			
C	0.3370	0.339	1			
D	0.5150	0.5350	4			
E	0.2680	0.3150	16			
F	0.0044	0.0049		0.00049	0.00394	
G	0.0906	0.1060	16			

LDC # 48792A96

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: SC
2nd Reviewer:

Method: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

Calibration Date	Instrument	Compound	Standard	(Y) Response ratio	(X) Conc. Ratio	(X^2) Conc. Ratio
7/6/2020	SCN977	PFOA	1	0.0283	0.02	0.00040
			2	0.0513	0.04	0.0016
			3	0.0937	0.08	0.0064
			4	0.1952	0.16	0.0256
			5	0.4739	0.40	0.1600
			6	0.8828	0.80	0.6400
			7	4.5622	4.00	16.0000
			8	9.3191	8.00	64.0000
			9	20.7411	20.00	400.0000
			10	41.4806	40.00	1600.0000

Regression Output	Calculated		Reported	
Constant	c	0.09230	c	0.0543225
Std Err of Y Est				.
Degrees of Freedom				
	b	a	b	a
X Coefficient(s)	1.09128	-0.0014190	1.13013	-0.000202972
Std Err of Coef.				
Correlation Coefficient		0.999825		
Coefficient of Determination (r^2)		0.999651		0.999173

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Method: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

Calibration Date	Instrument	Compound	Standard	(Y) Response ratio	(X) Conc. Ratio	(X^2) Conc. Ratio
7/6/2020	SCN977	PFOS	1	0.0184	0.02	0.00040
			2	0.0397	0.04	0.0016
			3	0.0806	0.08	0.0064
			4	0.1980	0.16	0.0256
			5	0.4633	0.40	0.1600
			6	1.0057	0.80	0.6400
			7	4.8637	4.00	16.0000
			8	10.3716	8.00	64.0000
			9	24.6679	20.00	400.0000
			10	47.3616	40.00	1600.0000

Regression Output	Calculated		Reported	
Constant	c	-0.03049	c	-0.0944633
Std Err of Y Est				
Degrees of Freedom				
	b	a	b	a
X Coefficient(s)	1.28839	-0.0026132	1.27905	-0.0001870130
Std Err of Coef.				
Correlation Coefficient		0.999980		
Coefficient of Determination (r^2)		0.999959		0.999703

LDC #: 48792A96

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Calculation Verification

Reviewer: SC
2nd Reviewer:

Method: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (aveRRF - RRF)/aveRRF
RRF = (Ax)(Cis)/(Ais)(Cx)

Where:
aveRRF = initial calib average RRF
RRF = continuing calib RRF
Ax = Area of compound
Cx = Concentration of compound,
Ais = Area of associated internal standard
Cis = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (IS)	Conc	Reported Conc	Recalculated Conc	Reported %R	Recalculated %R
1	200706P1_48	6/30/2020	PFOA (13C2-PFOA)	10.0	9.81	9.81	98.1	98.1
			PFOS (13C8-PFOS)	10.0	9.91	9.89	99.1	98.9
2			PFOA (13C2-PFOA)					
			PFOS (13C8-PFOS)					
3			PFOA (13C2-PFOA)					
			PFOS (13C8-PFOS)					
4			PFOA (13C2-PFOA)					
			PFOS (13C8-PFOS)					
5			PFOA (13C2-PFOA)					
			PFOS (13C8-PFOS)					
6			PFOA (13C2-PFOA)					
			PFOS (13C8-PFOS)					

LDC #: 48792A96

VALIDATION FINDINGS WORKSHEET
LCS Results Verification

Reviewer: SC
2nd Reviewer:

Method: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

The percent recoveries (%R) and relative percent differences (RPD) of the laboratory control sample and laboratory control duplicate were recalculated for the compounds identified below using the following calculation:

SSC = (Area spike) (Conc IS) / (Area IS) (average RRF spike)
%Recovery = 100 * SSC/SA

Where:
SSC = Spiked concentration
SA = Spike added
LCS = Laboratory control spike recovery
LCSD = Laboratory control spike duplicate recovery

RPD = | LCS - LCSD | * 2/(LCS + LCSD)

LCS/LCSD ID: B0F0257-BS/D1

Compound	SA (ug/L)		SSC (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalc.
PFOA	0.0400	0.0400	0.0391	0.0393	97.7	97.8	98.2	98.3	0.463	0.510
PFOS	0.0400	0.0400	0.0386	0.0384	96.5	96.5	96.1	96.0	0.435	0.519

LDC #: 47924B6

VALIDATION FINDINGS WORKSHEET
Sample Results Verification

Reviewer: SC
2nd Reviewer:

Method: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

Compound results for all Level IV samples reported with a positive detect were recalculated and verified using the following equation:

$$\text{Concentration} = \frac{(Ax)\,(Cis)\,(Vt)\,(DF)}{(Ais)\,(RRF)\,(Vo)}$$

Where:

Ax = Area or height of the peak for the compound to be measured
Ais = Area or height of the peak for the internal standard
Cis = Concentration of the internal standard
DF = Dilution factor
Vt = Volume of extract in milliliters (mL)
RRF = Average relative response factor
Vo = Volume of sample in liters (L)

Sample #	Compound	Ax	Ais	Cis	DF	RRF	Vt (mL)	Vo (mL)	Calculated Concentration (ug/L)	Reported Concentration (ug/L)	% Diff
1	PFOS	5.670E+03	2.408E+03	12.5	1	curve	1	255.63	0.0906	0.0906	0

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: MCAS El Toro and Tustin PFAS

LDC Report Date: August 25, 2020

Parameters: Perfluoroalkyl & Polyfluoroalkyl Substances

Validation Level: Stage 4

Laboratory: Vista Analytical Laboratory

Sample Delivery Group (SDG): 2001409

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
IS72MW16DR-20200701	2001409-02	Water	07/01/20
IS72MW15D-20200701	2001409-03	Water	07/01/20
222MW09D-20200701	2001409-04	Water	07/01/20
DUP02-20200701	2001409-05	Water	07/01/20
IS72MW17D-20200701	2001409-06	Water	07/01/20
DUP03-20200701	2001409-07	Water	07/01/20
I003MW01D-20200701	2001409-08	Water	07/01/20
I003MW02D-20200701	2001409-09	Water	07/01/20
DUP04-20200701	2001409-10	Water	07/01/20
I003MW05D-20200701	2001409-11	Water	07/01/20
TW07D-20200702	2001409-13	Water	07/02/20
TW05D-20200702	2001409-14	Water	07/02/20
IS72MW16DR-20200701MS	2001409-02MS	Water	07/01/20
IS72MW16DR-20200701MSD	2001409-02MSD	Water	07/01/20
I003MW01D-20200701MS	2001409-08MS	Water	07/01/20
I003MW01D-20200701MSD	2001409-08MSD	Water	07/01/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Sampling and Analysis Plan for Per- and Polyfluoroalkyl Substances in Groundwater in Carve-Outs 2, 5, 6, and 9 and Groundwater and Surface Water Near Operable Unit 3, Former Marine Corps Air Station Tustin, Tustin, California, with Addendum #02 to Final Sampling and Analysis Plan for Per- and Polyfluoroalkyl Substances Sampling for Groundwater Remedial Action at Operable Unit 3, Installation Restoration Program Site 1 (February 2020), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), and the DoD General Validation Guidelines (February 2018). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS) by Environmental Protection Agency (EPA) Method 537 Modified and LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. LC/MS Instrument Performance Check

Instrument performance was checked and the requirements were met.

III. Initial Calibration and Initial Calibration Verification

Initial calibration was performed as required by the methods.

A curve fit, based on the initial calibration, was established for quantitation. The coefficient of determination (r^2) was greater than or equal to 0.990.

For each calibration standard, all compounds were within 70-130% of their true value.

The signal to noise (S/N) ratio was within validation criteria for all compounds.

Retention time windows were established as required by the methods.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds.

IV. Continuing Calibration and Instrument Sensitivity Check

Continuing calibration was performed at required frequencies.

The percent differences (%D) were less than or equal to 30.0% for all compounds.

The signal to noise (S/N) ratio was within validation criteria for all compounds.

The percent differences (%D) of the instrument sensitivity check (ISC) were less than or equal to 30.0% for all compounds.

Retention times of all compounds in the calibration standards were within the established retention time windows.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Samples EB02-20200701 and EB03-20200702 were identified as equipment blanks. No contaminants were found.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Compound	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
I003MW01D-20200701MS/MSD (I003MW01D-20200701)	PFNA	133 (69-130)	-	J (all detects)	A

For I003MW01D-20200701MS/MSD, no data were qualified for PFBS and PFHpA percent recoveries (%R) outside the QC limits since the parent sample results were greater than 4X the spike concentration.

PFHxA, PFHxS, PFOA, and PFOS percent recoveries (%R) and PFHxA, PFHxS, and PFOS relative percent differences (RPD) were not within the QC limits for I003MW01D-20200701MS/MSD. No data were qualified for MS/MSD samples analyzed greater than or equal to a 5X dilution.

Relative percent differences (RPD) were within QC limits.

VIII. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

IX. Field Duplicates

Samples 222MW09D-20200701 and DUP02-20200701, samples IS72MW17D-20200701 and DUP03-20200701, and samples I003MW02D-20200701 and DUP04-20200701 were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Compound	Concentration (ug/L)		RPD (Limits)	Difference (Limits)	Flag	A or P
	222MW09D-20200701	DUP02-20200701				
PFBS	0.0105	0.0105	-	0 (≤0.00405)	-	-
PFHxA	0.0207	0.0226	9 (≤30)	-	-	-

Compound	Concentration (ug/L)		RPD (Limits)	Difference (Limits)	Flag	A or P
	222MW09D-20200701	DUP02-20200701				
PFHpA	0.00555	0.00521	-	0.0003 (≤0.00405)	-	-
PFHxS	0.0702	0.0610	14 (≤30)	-	-	-
PFOA	0.0839	0.0822	2 (≤30)	-	-	-
PFOS	0.0150	0.0154	-	0.0004 (≤0.00405)	-	-

Compound	Concentration (ug/L)		RPD (Limits)	Difference (Limits)	Flag	A or P
	IS72MW17D-20200701	DUP03-20200701				
PFBS	0.0262	0.0285	8 (≤30)	-	-	-
PFHxA	0.185	0.189	2 (≤30)	-	-	-
PFHpA	0.0980	0.0945	4 (≤30)	-	-	-
PFHxS	0.0788	0.0737	7 (≤30)	-	-	-
PFOA	0.781	0.755	3 (≤30)	-	-	-
PFNA	0.00477	0.00546	-	0.00069 (≤0.00409)	-	-
PFOS	0.0432	0.0418	3 (≤30)	-	-	-

Compound	Concentration (ug/L)		RPD (Limits)	Difference (Limits)	Flag	A or P
	I003MW02D-20200701	DUP04-20200701				
PFBS	0.364	0.397	9 (≤30)	-	-	-
PFHxA	2.59	2.57	1 (≤30)	-	-	-
PFHpA	0.537	0.529	2 (≤30)	-	-	-
PFHxS	2.49	2.59	4 (≤30)	-	-	-
PFOA	11.1	11.0	1 (≤30)	-	-	-
PFNA	0.00392	0.00425	-	0.00033 (≤0.00400)	-	-
PFOS	0.879	0.972	10 (≤30)	-	-	-

X. Labeled Compounds

All percent recoveries (%R) for labeled compounds used to quantitate target compounds were within QC limits with the following exceptions:

Sample	Labeled Compound	%R (Limits)	Affected Compound	Flag	A or P
TW07D-20200702	13C2-PFDoA 13C2-PFTeDA	46.2 (50-150) 12.6 (50-150)	PFDoA PFTrDA 11Cl-PF30UdS PFTeDA	NA	-
TW05D-20200702	13C2-PFTeDA	28.0 (50-150)	PFTeDA	NA	-

XI. Compound Quantitation

All compound quantitations met validation criteria.

XII. Target Compound Identifications

All target compound identifications met validation criteria with the following exceptions:

Sample	Compound	Ion Abundance Ratio (Limits)	Flag	A or P
222MW09D-20200701	PFOS	3.506 (1.003-3.008)	J (all detects)	P
DUP02-20200701	PFOS	3.255 (1.003-3.008)	J (all detects)	P

XIII. System Performance

The system performance was acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to MS/MSD %R and ion abundance ratio, data were qualified as estimated in three samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable.

MCAS El Toro and Tustin PFAS
Perfluoroalkyl & Polyfluoroalkyl Substances - Data Qualification Summary - SDG 2001409

Sample	Compound	Flag	A or P	Reason
I003MW01D-20200701	PFNA	J (all detects)	A	Matrix spike/Matrix spike duplicate (%R)
222MW09D-20200701 DUP02-20200701	PFOS	J (all detects)	P	Target compound identification (ion abundance ratio)

MCAS El Toro and Tustin PFAS
Perfluoroalkyl & Polyfluoroalkyl Substances - Laboratory Blank Data Qualification Summary - SDG 2001409

No Sample Data Qualified in this SDG

MCAS El Toro and Tustin PFAS
Perfluoroalkyl & Polyfluoroalkyl Substances - Field Blank Data Qualification Summary - SDG 2001409

No Sample Data Qualified in this SDG

LDC #: 48792B96 **VALIDATION COMPLETENESS WORKSHEET** Date: 8/14/20

SDG #: 2001409 Stage 4 Page: 1 of 2

Laboratory: Vista Analytical Laboratory Reviewer: M

2nd Reviewer:

METHOD: LC/MS Perfluoroalkyl & Polyfluoroalkyl Substances (EPA Method 537M/QSM 5.3 Table B-15)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	LC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / A	%D TV/ICV ≤ 30
IV.	Continuing calibration/ISC	A/A	%D ≤ 30
V.	Laboratory Blanks	A	
VI.	Field blanks	ND	EB02-20200701, EB03-20200702
VII.	Matrix spike/Matrix spike duplicates	SW	
VIII.	Laboratory control samples	A	LCS
IX.	Field duplicates	SW	D = 3+4, 5+6, 8+9
X.	Labeled Compounds	SW	
VI.	Compound quantitation RL/LOQ/LODs	A	
XII.	Target compound identification	SW	
XIII.	System performance	A	
XIV.	Overall assessment of data	A	

Note: A = Acceptable ND = No compounds detected D = Duplicate SB=Source blank
N = Not provided/applicable R = Rinsate TB = Trip blank OTHER:
SW = See worksheet FB = Field blank EB = Equipment blank

	Client ID	Lab ID	Matrix	Date
1	IS72MW16DR-20200701	2001409-02	Water	07/01/20
2	IS72MW15D-20200701	2001409-03	Water	07/01/20
3	222MW09D-20200701	2001409-04	Water	07/01/20
4	DUP02-20200701	2001409-05	Water	07/01/20
5	IS72MW17D-20200701	2001409-06	Water	07/01/20
6	DUP03-20200701	2001409-07	Water	07/01/20
7	I003MW01D-20200701	2001409-08	Water	07/01/20
8	I003MW02D-20200701	2001409-09	Water	07/01/20
9	DUP04-20200701	2001409-10	Water	07/01/20
10	I003MW05D-20200701	2001409-11	Water	07/01/20
11	TW07D-20200702	2001409-13	Water	07/02/20
12	TW05D-20200702	2001409-14	Water	07/02/20
13	IS72MW16DR-20200701MS	2001409-02MS	Water	07/01/20
14	IS72MW16DR-20200701MSD	2001409-02MSD	Water	07/01/20
15	I003MW01D-20200701MS	2001409-08MS	Water	07/01/20

LDC #: 48792B96 **VALIDATION COMPLETENESS WORKSHEET** Date: 8/14/20

SDG #: 2001409 Stage 4 Page: 2 of 2

Laboratory: Vista Analytical Laboratory Reviewer:

2nd Reviewer:

METHOD: LC/MS Perfluoroalkyl & Polyfluoroalkyl Substances (EPA Method 537M/QSM 5.3 Table B-15)

16	I003MW01D-20200701MSD	2001409-08MSD	Water	07/01/20
17				
18				
19				

Notes:

	BOGD034						

LDC #: 48795B96

VALIDATION FINDINGS CHECKLIST

Reviewer: [illegible]
2nd Reviewer: [illegible]

Method: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Were cooler temperature criteria met?	✓			
II. LC/MS Instrument performance check				
Were the instrument performance reviewed and found to be within the validation criteria?	✓			
III. Initial calibration and Initial calibration verification				
Did the laboratory perform a 5-point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) $\leq$ 20%?			✓	
Was a curve fit used for evaluation? If yes, did the initial calibration meet the coefficient of determination (r^2) criteria of $\geq$ 0.990?	✓			
Were all analytes within 70-130% or percent differences (%D) $\leq$30% of their true value for each calibration standard?	✓			
Was the signal to noise (S/N) ratio for all compounds within the validation criteria?	✓			
Were the retention time windows properly established?	✓			
Was an initial calibration verification (ICV) standard analyzed after each initial calibration for each instrument?	✓			
Were all ICV percent differences (%D) of the initial calibration verification $\leq$ 30%?	✓			
IV. Continuing calibration and Instrument sensitivity check				
Was a continuing calibration analyzed prior to sample analysis, after every 10 samples and at the end of the analytical sequence?	✓			
Were all percent differences (%D) of the continuing calibration $\leq$ 30%?	✓			
Were all the retention times within the acceptance windows?	✓			
Was the signal to noise (S/N) ratio for all compounds within the validation criteria?	✓			
Were all percent differences (%D) of the Instrument Sensitivity Check $\leq$ 30%?	✓			
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks?		✓		
VI. Field blanks				
Were field blanks identified in this SDG?	✓			
Were target compounds detected in the field blanks?		✓		

LDC #: 46792B96

VALIDATION FINDINGS CHECKLIST

Reviewer: IV
2nd Reviewer: IV

Validation Area	Yes	No	NA	Findings/Comments
VII. Matrix spike/Matrix spike duplicates				
Were matrix spike (MS) and matrix spike duplicate (MSD) analyzed in this SDG?	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?		✓		
VIII. Laboratory control samples				
Was an LCS analyzed per extraction batch for this SDG?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
IX. Field duplicates				
Were field duplicate pairs identified in this SDG?	✓			
Were target compounds detected in the field duplicates?	✓			
X. Labeled compounds				
Were labeled compound percent recoveries (%R) within the QC limits?		✓		
Were retention times within 0.4 minutes of the associated calibration standard?	✓			
XI. Compound quantitation				
Did the laboratory reporting limits (i.e. DL, LOD, LOQ) meet the QAPP?	✓			
Did reported results include both branched and linear isomers?	✓			
Were the correct ion transition, labeled compound and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound retention times within 0.1 minutes of the associated labeled compound for compounds with a labeled analog?	✓			
Were compound quantitation and reporting limits adjusted to reflect all sample dilutions and dry weight factors applicable to Stage 4 validation?	✓			
XII. Target compound identification				
Was the signal to noise (S/N) ratio for all compounds within the validation criteria?	✓			
Were two transitions and the ion transition ratio per analyte monitored and documented with the exception of PFBA and PFPeA?	✓			
Were ion ratios between 50-150%?		✓		
XIII. System performance				
System performance was found to be acceptable.	✓			
XIV. Overall assessment of Data				
Overall assessment of data was found to be acceptable.	✓			

TARGET COMPOUND WORKSHEET

METHOD: PFAS

A. PFBS		
B. PFHxA		
C. PFHpA		
D. PFHxS		
E. PFOA		
F. PFNA		
G. PFOS		
H. PFDA		
I. MeFOSAA		
J. EtFOSAA		
K. PFUnA		
L. PFDoA		
M. PFTrDA		
N. PFTeDA		
O. HFPO-DA		
P. ADONA		
Q. 9Cl-PF30NS		
R. 11Cl-PF30UdS		

LDC #: 49792B96

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates Results

Page: 1 of 1
Reviewer:
2nd Reviewer:

METHOD: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DOD QSM 5.1
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

(Y) N N/A Were a matrix spike (MS) and matrix spike duplicate (MSD) or duplicate sample analyzed for each matrix in this SDG?
(Y) N N/A Was a MS/MSD analyzed every 20 samples of each matrix?
Y (N) N/A Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?

#	Date	MS/MSD ID	Compound	MS %R (Limits)	MSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
		15/16	A		48.3 (72-130)		7 (dets)	No qual. >4x
			C	250 (72-130)	265 ↓			↓
			F	133 (69-130				J dets/A
		15/16 (10x)	B, D, E, G	%RS out			7 (dets)	No qual. >4x
			B			32 (≤30)		
			D			39 ↓		
			G			31		

Reported RPDs based on %RS. RPDs evaluated using conc.

LDC #: 48792B96

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: SC
2nd Reviewer: [illegible]

Method: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.1

Compound	Concentration (ug/L)		RPD≤30	Difference (<5XLOQ)	Difference (<LOQ)	Qualification
	1	2				
A	0.0105	0.0105		0	0.00405	
B	0.0207	0.0226	9			
C	0.00555	0.00521		0.0003	0.00405	
D	0.0702	0.0610	14			
E	0.0839	0.0822	2			
G	0.0150	0.0154		0.0004	0.00405	

Compound	Concentration (ug/L)		RPD≤30	Difference (<5XLOQ)	Difference (<LOQ)	Qualification
	5	6				
A	0.0262	0.0285	8			
B	0.185	0.189	2			
C	0.0980	0.0945	4			
D	0.0788	0.0737	7			
E	0.781	0.755	3			
F	0.00477	0.00546		0.00069	0.00409	
G	0.0432	0.0418	3			

Compound	Concentration (ug/L)		RPD≤30	Difference (<5XLOQ)	Difference (<LOQ)	Qualification
	8	9				
A	0.364	0.397	9			
B	2.59	2.57	1			
C	0.537	0.529	2			
D	2.49	2.59	4			
E	11.1	11.0	1			
F	0.00392	0.00425		0.00033	0.00400	
G	0.879	0.972	10			

LDC #: 48792B96

VALIDATION FINDINGS WORKSHEET
Labeled Compounds

Reviewer: π
2nd Reviewer: T

METHOD: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".
Y (N) N/A Were all labeled compound recoveries within the QC criteria?

#	Date	Lab ID/Reference	Labeled Compound	% Recovery (Limit)	Qualifications
		11TB4 (ND)	DDA	46.2 (50-150)	Jdet/P (L, M, R)
			TDA	12.6	(N)
		12TB4		28.0	(N)

BS = 13C3-PFBS HXS = 13C3-PFHxS OS = 13C8-PFOS TDA = 13C2-PFTeDA EFOS = d5-EtFOSAA
HXA = 13C2-PFHxA NA = 13C5-PFNA DA = 13C2-PFDA DDA = 13C2-PFDoA
HPA = 13C4-PFHpA OA = 13C2-PFOA UDA = 13C2-PFUnA MFOS = d3-MeFOSAA

LDC #: 48792B96

VALIDATION FINDINGS WORKSHEET
Target Compound Identification

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y (N) N/A Was the signal to noise (S/N) ratio for all compounds within the validation criteria?
Y (N) N/A Were two transitions and the ion transition ratio per analyte monitored and documented with the exception of PFBA and PFPeA?
Y (N) N/A Were ion ratios within QC limits and between 50-150%?

#	Date	Sample ID	Associated Compound	Ion ratio (~~%D≤50~~ limit)	Qualifications
		3	G	3.506 (1.003-3.008)	J (det)/P
		↓	↓	↓	↓
		4	↓	3.255	↓

LDC # 48792B96

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: SC
2nd Reviewer:

Method: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

Calibration Date	Instrument	Compound	Standard	(Y) Response ratio	(X) Conc. Ratio	(X^2) Conc. Ratio
7/14/2020	SCN945/960	PFOA	1	0.0391	0.02	0.00040
			2	0.0607	0.04	0.0016
			3	0.1111	0.08	0.0064
			4	0.2362	0.16	0.0256
			5	0.6220	0.40	0.1600
			6	1.1520	0.80	0.6400
			7	6.2166	4.00	16.0000
			8	11.3946	8.00	64.0000
			9	26.3657	20.00	400.0000
			10	53.5565	40.00	1600.0000

Regression Output	Calculated		Reported	
Constant	c	0.15850	c	0.1102520
Std Err of Y Est				.
Degrees of Freedom				
	b	a	b	a
X Coefficient(s)	1.36351	-0.0006947	1.42944	-0.000207503
Std Err of Coef.				
Correlation Coefficient		0.999826		
Coefficient of Determination (r^2)		0.999652		0.99882

LDC #: 18792B96

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: SC
2nd Reviewer:

Method: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

Calibration Date	Instrument	Compound	Standard	(Y) Response ratio	(X) Conc. Ratio	(X^2) Conc. Ratio
7/14/2020	SCN945/960	PFOS	1	0.0227	0.02	0.00040
			2	0.0317	0.04	0.0016
			3	0.0814	0.08	0.0064
			4	0.1498	0.16	0.0256
			5	0.4309	0.40	0.1600
			6	0.7906	0.80	0.6400
			7	4.2751	4.00	16.0000
			8	8.1452	8.00	64.0000
			9	19.0425	20.00	400.0000
			10	38.9489	40.00	1600.0000

Regression Output	Calculated		Reported	
Constant	c	0.08248	c	-0.0037090
Std Err of Y Est				
Degrees of Freedom				
	b	a	b	a
X Coefficient(s)	0.970908	0.0000222	1.008000	-0.0000832828
Std Err of Coef.				
Correlation Coefficient		0.999885		
Coefficient of Determination (r^2)		0.999771		0.998246

LDC # 47862 B96

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: SC
2nd Reviewer:

Method: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

Calibration Date	Instrument	Compound	Standard	(Y) Response ratio	(X) Conc. Ratio	(X^2) Conc. Ratio
7/15/2020	SCN945/960	PFOA	1	0.0339	0.02	0.00040
			2	0.0701	0.04	0.0016
			3	0.1254	0.08	0.0064
			4	0.2383	0.16	0.0256
			5	0.6010	0.40	0.1600
			6	1.2023	0.80	0.6400
			7	6.0452	4.00	16.0000
			8	11.7530	8.00	64.0000
			9	27.7324	20.00	400.0000
			10	51.9259	40.00	1600.0000

Regression Output	Calculated		Reported	
Constant	c	0.03546	c	0.0669438
Std Err of Y Est				
Degrees of Freedom				
	b	a	b	a
X Coefficient(s)	1.49055	-0.0048287	1.50337	-0.000416136
Std Err of Coef.				
Correlation Coefficient		0.999991		
Coefficient of Determination (r^2)		0.999981		0.999939

LDC #: 48972B96

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: SC
2nd Reviewer:

Method: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

Calibration Date	Instrument	Compound	Standard	(Y) Response ratio	(X) Conc. Ratio	(X^2) Conc. Ratio
7/15/2020	SCN945/960	PFOS	1	0.0161	0.02	0.00040
			2	0.0303	0.04	0.0016
			3	0.0746	0.08	0.0064
			4	0.1589	0.16	0.0256
			5	0.4236	0.40	0.1600
			6	0.8187	0.80	0.6400
			7	4.1694	4.00	16.0000
			8	7.9315	8.00	64.0000
			9	20.4718	20.00	400.0000
			10	38.8811	40.00	1600.0000

Regression Output	Calculated		Reported	
Constant	c	-0.03613	c	-0.0860112
Std Err of Y Est				
Degrees of Freedom				
	b	a	b	a
X Coefficient(s)	1.051162	-0.0019514	1.03891	-0.0001274520
Std Err of Coef.				
Correlation Coefficient		0.999955		
Coefficient of Determination (r^2)		0.999911		0.999761

LDC #: 48792B96

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: SC
2nd Reviewer:

Method: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

Calibration Date	Instrument	Compound	Standard	(Y) Response ratio	(X) Conc. Ratio	(X^2) Conc. Ratio
7/16/2020	SCN945/960	PFOA	1	0.0305	0.02	0.00040
			2	0.0521	0.04	0.0016
			3	0.1192	0.08	0.0064
			4	0.2380	0.16	0.0256
			5	0.5742	0.40	0.1600
			6	1.1541	0.80	0.6400
			7	5.8217	4.00	16.0000
			8	11.3244	8.00	64.0000
			9	26.9039	20.00	400.0000
			10	49.4671	40.00	1600.0000

Regression Output	Calculated		Reported	
Constant	c	0.00837	c	-0.0054419
Std Err of Y Est				
Degrees of Freedom				
	b	a	b	a
X Coefficient(s)	1.45774	-0.0055315	1.46173	-0.000451650
Std Err of Coef.				
Correlation Coefficient		0.999999		
Coefficient of Determination (r^2)		0.999998		0.999976

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Method: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

Calibration Date	Instrument	Compound	Standard	(Y) Response ratio	(X) Conc. Ratio	(X^2) Conc. Ratio
7/16/2020	SCN945/960	PFOS	1	0.0152	0.02	0.00040
			2	0.0407	0.04	0.0016
			3	0.0966	0.08	0.0064
			4	0.1510	0.16	0.0256
			5	0.4276	0.40	0.1600
			6	0.7511	0.80	0.6400
			7	4.2366	4.00	16.0000
			8	7.8487	8.00	64.0000
			9	18.9035	20.00	400.0000
			10	38.4993	40.00	1600.0000

Regression Output	Calculated		Reported	
Constant	c	0.06995	c	0.0058948
Std Err of Y Est				
Degrees of Freedom				
	b	a	b	a
X Coefficient(s)	0.95629	0.0001198	0.98734	-0.0000616685
Std Err of Coef.				
Correlation Coefficient		0.999926		
Coefficient of Determination (r^2)		0.999853		0.999295

LDC #: 48792B96

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Calculation Verification

Reviewer: SC
2nd Reviewer:

Method: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (aveRRF - RRF)/aveRRF
RRF = (Ax)(Cis)/(Ais)(Cx)

Where:
aveRRF = initial calib average RRF
RRF = continuing calib RRF
Ax = Area of compound
Cx = Concentration of compound,
Ais = Area of associated internal standard
Cis = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (IS)	Conc	Reported Conc	Recalculated Conc	Reported %R	Recalculated %R
1	200714M1_63	7/15/2020	PFOA (13C2-PFOA)	1.00	0.997	0.997	99.4	99.7
			PFOS (13C8-PFOS)	1.00	1.160	1.159	115.9	115.9
2	200714M1_83	7/15/2020	PFOA (13C2-PFOA)	10.00	9.23	9.23	92.3	92.3
			PFOS (13C8-PFOS)	10.00	11.6	11.6	116.3	116.2
3	200716M1_27	7/16/2020	PFOA (13C2-PFOA)	10.00	10.50	10.49	104.9	104.9
			PFOS (13C8-PFOS)	10.00	10.20	10.20	102.1	102.0
4			PFOA (13C2-PFOA)					
			PFOS (13C8-PFOS)					
5			PFOA (13C2-PFOA)					
			PFOS (13C8-PFOS)					
6			PFOA (13C2-PFOA)					
			PFOS (13C8-PFOS)					

LDC #: 45792B96

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates Results Verification

Reviewer: SC
2nd Reviewer:

Method: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

The percent recoveries (%R) and relative percent differences (RPD) of the matrix spike and matrix spike duplicate were recalculated for the compounds identified below using the following calculation:

SSC = (Area spike) (Conc IS) / (Area IS) (average RRF spike)
%Recovery = 100 * (SSC - SC)/SA

Where: SSC = Spiked concentration; SA = Spike added; SC = Sample concentration

RPD = | MS - MSD | * 2/(MS + MSD)

MS = Matrix spike recovery; MSD = Matrix spike duplicate recovery

MS/MSD ID: 13/14

Compound	SA (ug/L)		SC (ug/L)	SSC (ug/L)		MS Percent Recovery		MSD Percent Recovery		MS/MSD RPD	
	MS	MSD		MS	MSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalc.
PFOA	0.0414	0.0409	0.1670	0.2120	0.2060	109	109	95.0	95.4	13.7	2.87
PFOS	0.0414	0.0409	0.0650	0.1150	0.1070	121	121	102	103	17.0	7.21

LDC #: 48792B96

VALIDATION FINDINGS WORKSHEET
LCS Results Verification

Reviewer: SC
2nd Reviewer:

Method: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

The percent recoveries (%R) and relative percent differences (RPD) of the laboratory control sample and laboratory control duplicate were recalculated for the compounds identified below using the following calculation:

SSC = (Area spike) (Conc IS) / (Area IS) (average RRF spike)
%Recovery = 100 * SSC/SA

Where:
SSC = Spiked concentration
SA = Spike added
LCS = Laboratory control spike recovery
LCSD = Laboratory control spike duplicate recovery

RPD = | LCS - LCSD | * 2/(LCS + LCSD)

LCS/LCSD ID: B0G0034-BS1

Compound	SA (ng/L)		SSC (ng/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalc.
PFOA	0.0400		0.0414		104	104				
PFOS	0.0400		0.0355		88.7	88.8				

LDC #: 48792B96

VALIDATION FINDINGS WORKSHEET
Sample Results Verification

Reviewer: SG
2nd Reviewer:

Method: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

Compound results for all Level IV samples reported with a positive detect were recalculated and verified using the following equation:

$$\text{Concentration} = \frac{(Ax)\,(Cis)\,(Vt)\,(DF)}{(Ais)\,(RRF)\,(Vo)}$$

Where:

Ax = Area or height of the peak for the compound to be measured
Ais = Area or height of the peak for the internal standard
Cis = Concentration of the internal standard
DF = Dilution factor
Vt = Volume of extract in milliters (mL)
RRF = Average relative response factor
Vo = Volume of sample in liters (L)

Sample #	Compound	Ax	Ais	Cis	DF	RRF	Vt (mL)	Vo (L)	Calculated Concentration (ug/L)	Reported Concentration (ug/L)	% Diff
1	PFOA	6.129E+04	1.362E+04	12.5	1	curve	1	236.45	0.167	0.167	0

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: MCAS El Toro and Tustin PFAS

LDC Report Date: August 25, 2020

Parameters: Perfluoroalkyl & Polyfluoroalkyl Substances

Validation Level: Stage 4

Laboratory: Vista Analytical Laboratory

Sample Delivery Group (SDG): 2001417

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
TW06D-20200706	2001417-02	Water	07/06/20
TW25D-20200706	2001417-03	Water	07/06/20
TW26D-20200706	2001417-04	Water	07/06/20
TW08D-20200706	2001417-05	Water	07/06/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Sampling and Analysis Plan for Per- and Polyfluoroalkyl Substances in Groundwater in Carve-Outs 2, 5, 6, and 9 and Groundwater and Surface Water Near Operable Unit 3, Former Marine Corps Air Station Tustin, Tustin, California, with Addendum #02 to Final Sampling and Analysis Plan for Per- and Polyfluoroalkyl Substances Sampling for Groundwater Remedial Action at Operable Unit 3, Installation Restoration Program Site 1 (February 2020), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), and the DoD General Validation Guidelines (February 2018). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS) by Environmental Protection Agency (EPA) Method 537 Modified and LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. LC/MS Instrument Performance Check

Instrument performance was checked and the requirements were met.

III. Initial Calibration and Initial Calibration Verification

Initial calibration was performed as required by the methods.

A curve fit, based on the initial calibration, was established for quantitation. The coefficient of determination (r^2) was greater than or equal to 0.990.

For each calibration standard, all compounds were within 70-130% of their true value.

The signal to noise (S/N) ratio was within validation criteria for all compounds.

Retention time windows were established as required by the methods.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds.

IV. Continuing Calibration and Instrument Sensitivity Check

Continuing calibration was performed at required frequencies.

The percent differences (%D) were less than or equal to 30.0% for all compounds.

The signal to noise (S/N) ratio was within validation criteria for all compounds.

The percent differences (%D) of the instrument sensitivity check (ISC) were less than or equal to 30.0% for all compounds.

Retention times of all compounds in the calibration standards were within the established retention time windows.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample EB04-20200706 was identified as an equipment blank. No contaminants were found.

VII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VIII. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

Relative percent differences (RPD) were within QC limits with the following exceptions:

LCS ID (Associated Samples)	Compound	RPD (Limits)	Flag	A or P
BOG0039-BS1/BSD1 (All samples in SDG 2001417)	PFTeDA	35.7 (≤30)	NA	-

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Labeled Compounds

All percent recoveries (%R) for labeled compounds used to quantitate target compounds were within QC limits with the following exceptions:

Sample	Labeled Compound	%R (Limits)	Affected Compound	Flag	A or P
TW06D-20200706	13C2-PFTeDA	27.0 (50-150)	PFTeDA	NA	-
TW25D-20200706	d5-EtFOSAA 13C2-PFDoA 13C2-PFTeDA	46.4 (50-150) 42.7 (50-150) 17.3 (50-150)	EtFOSAA PFDoA PFTrDA 11Cl-PF30UdS PFTeDA	NA	-
TW26D-20200706	13C2-PFTeDA	24.3 (50-150)	PFTeDA	NA	-

XI. Compound Quantitation

All compound quantitations met validation criteria.

XII. Target Compound Identifications

All target compound identifications met validation criteria.

XIII. System Performance

The system performance was acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable.

MCAS El Toro and Tustin PFAS
Perfluoroalkyl & Polyfluoroalkyl Substances - Data Qualification Summary - SDG 2001417

No Sample Data Qualified in this SDG

MCAS El Toro and Tustin PFAS
Perfluoroalkyl & Polyfluoroalkyl Substances - Laboratory Blank Data Qualification Summary - SDG 2001417

No Sample Data Qualified in this SDG

MCAS El Toro and Tustin PFAS
Perfluoroalkyl & Polyfluoroalkyl Substances - Field Blank Data Qualification Summary - SDG 2001417

No Sample Data Qualified in this SDG

LDC #: 48792C96 **VALIDATION COMPLETENESS WORKSHEET** Date: 8/14/20

SDG #: 2001417 Stage 4 Page: 1 of 1

Laboratory: Vista Analytical Laboratory Reviewer: [illegible]

2nd Reviewer: [illegible]

METHOD: LC/MS Perfluoroalkyl & Polyfluoroalkyl Substances (EPA Method 537M/QSM 5.3 Table B-15)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	LC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / A	r² ≥0.99 ≤30
IV.	Continuing calibration/ISC	A/A	D ≤30
V.	Laboratory Blanks	A	
VI.	Field blanks	ND	EB04-20200706
VII.	Matrix spike/Matrix spike duplicates	N	
VIII.	Laboratory control samples	SW	LCS/D
IX.	Field duplicates	N	
X.	Labeled Compounds	SW	
VI.	Compound quantitation RL/LOQ/LODs	A	
XII.	Target compound identification	A	
XIII.	System performance	A	
XIV.	Overall assessment of data	A	

Note: A = Acceptable; ND = No compounds detected; D = Duplicate; SB=Source blank
N = Not provided/applicable; R = Rinsate; TB = Trip blank; OTHER:
SW = See worksheet; FB = Field blank; EB = Equipment blank

	Client ID	Lab ID	Matrix	Date
1	TW06D-20200706	2001417-02	Water	07/06/20
2	TW25D-20200706	2001417-03	Water	07/06/20
3	TW26D-20200706	2001417-04	Water	07/06/20
4	TW08D-20200706	2001417-05	Water	07/06/20
5				
6				
7				
8				
9				
10				

Notes:

	B0G0039						

LDC #: 48792Q96

VALIDATION FINDINGS CHECKLIST

Reviewer: [illegible]
2nd Reviewer: [illegible]

Method: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Were cooler temperature criteria met?	✓			
II. LC/MS Instrument performance check				
Were the instrument performance reviewed and found to be within the validation criteria?	✓			
III. Initial calibration and Initial calibration verification				
Did the laboratory perform a 5-point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20%?		✓	✓	
Was a curve fit used for evaluation? If yes, did the initial calibration meet the coefficient of determination (r^2) criteria of ≥ 0.990?	✓			
Were all analytes within 70-130% or percent differences (%D) ≤30% of their true value for each calibration standard?	✓			
Was the signal to noise (S/N) ratio for all compounds within the validation criteria?	✓			
Were the retention time windows properly established?	✓			
Was an initial calibration verification (ICV) standard analyzed after each initial calibration for each instrument?	✓			
Were all ICV percent differences (%D) of the initial calibration verification ≤ 30%?	✓			
IV. Continuing calibration and Instrument sensitivity check				
Was a continuing calibration analyzed prior to sample analysis, after every 10 samples and at the end of the analytical sequence?	✓			
Were all percent differences (%D) of the continuing calibration ≤ 30%?	✓			
Were all the retention times within the acceptance windows?	✓			
Was the signal to noise (S/N) ratio for all compounds within the validation criteria?	✓			
Were all percent differences (%D) of the Instrument Sensitivity Check ≤ 30%?	✓			
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks?		✓		
VI. Field blanks				
Were field blanks identified in this SDG?	✓			
Were target compounds detected in the field blanks?		✓		

Validation Area	Yes	No	NA	Findings/Comments
VII. Matrix spike/Matrix spike duplicates				
Were matrix spike (MS) and matrix spike duplicate (MSD) analyzed in this SDG?		✓		
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
VIII. Laboratory control samples				
Was an LCS analyzed per extraction batch for this SDG?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?		✓		
IX. Field duplicates				
Were field duplicate pairs identified in this SDG?	•	✓		
Were target compounds detected in the field duplicates?			✓	
X. Labeled compounds				
Were labeled compound percent recoveries (%R) within the QC limits?		✓		
Were retention times within 0.4 minutes of the associated calibration standard?	✓			
XI. Compound quantitation				
Did the laboratory reporting limits (i.e. DL, LOD, LOQ) meet the QAPP?	✓			
Did reported results include both branched and linear isomers?	✓			
Were the correct ion transition, labeled compound and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound retention times within 0.1 minutes of the associated labeled compound for compounds with a labeled analog?	✓			
Were compound quantitation and reporting limits adjusted to reflect all sample dilutions and dry weight factors applicable to Stage 4 validation?	✓			
XII. Target compound identification				
Was the signal to noise (S/N) ratio for all compounds within the validation criteria?	✓			
Were two transitions and the ion transition ratio per analyte monitored and documented with the exception of PFBA and PFPeA?	✓			
Were ion ratios between 50-150%?	✓			
XIII. System performance				
System performance was found to be acceptable.	✓			
XIV. Overall assessment of Data				
Overall assessment of data was found to be acceptable.	✓			

TARGET COMPOUND WORKSHEET

METHOD: PFAS

A. PFBS		
B. PFHxA		
C. PFHpA		
D. PFHxS		
E. PFOA		
F. PFNA		
G. PFOS		
H. PFDA		
I. MeFOSAA		
J. EtFOSAA		
K. PFUnA		
L. PFDoA		
M. PFTrDA		
N. PFTeDA		
O. HFPO-DA		
P. ADONA		
Q. 9Cl-PF30NS		
R. 11Cl-PF30UdS		

LDC #: 48792C96

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Page: 1 of 1
Reviewer: g
2nd Reviewer: [illegible]

METHOD: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DOD QSM 5.3

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

(Y) N N/A Was a LCS required?

Y (N) N/A Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?

#	LCS/LCSD ID	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	B0G0039-BS/BSD1	N			35.7 (≤30)	All (ND)	J dets/P

LDC #: 48792C96

VALIDATION FINDINGS WORKSHEET
Labeled Compounds

Reviewer: [illegible]
2nd Reviewer: [illegible]

METHOD: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".
Y (N) N/A Were all labeled compound recoveries within the QC criteria?

#	Date	Lab ID/Reference	Labeled Compound	% Recovery (Limit)	Qualifications
		1 (ND)	TDA	27.0 (50-150)	Jdets/P (N)
		2	EFOS	46.4	(J)
			DDA	42.7	(L, M, R)
			TDA	17.3	(N)
		3 (ND)	TDA	24.3	

BS = 13C3-PFBS HXS = 13C3-PFHxS OS = 13C8-PFOS TDA = 13C2-PFTeDA EFOS = d5-EtFOSAA
HXA = 13C2-PFHxA NA = 13C5-PFNA DA = 13C2-PFDA DDA = 13C2-PFDoA
HPA = 13C4-PFHpA OA = 13C2-PFOA UDA = 13C2-PFUnA MFOS = d3-MeFOSAA

LDC # 48792096

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: SC
2nd Reviewer:

Method: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

Calibration Date	Instrument	Compound	Standard	(Y) Response ratio	(X) Conc. Ratio	(X^2) Conc. Ratio
7/10/2020	SCN982	PFOA	1	0.0371	0.02	0.00040
			2	0.0615	0.04	0.0016
			3	0.1197	0.08	0.0064
			4	0.2327	0.16	0.0256
			5	0.6277	0.40	0.1600
			6	1.1434	0.80	0.6400
			7	5.5884	4.00	16.0000
			8	11.6240	8.00	64.0000
			9	26.4062	20.00	400.0000
			10	51.9666	40.00	1600.0000

Regression Output	Calculated		Reported	
Constant	c	0.08117	c	0.1077220
Std Err of Y Est				.
Degrees of Freedom				
	b	a	b	a
X Coefficient(s)	1.38891	-0.0022976	1.42034	-0.000256585
Std Err of Coef.				
Correlation Coefficient		0.999908		
Coefficient of Determination (r^2)		0.999815		0.999514

LDC #: 48192096

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: SC
2nd Reviewer:

Method: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

Calibration Date	Instrument	Compound	Standard	(Y) Response ratio	(X) Conc. Ratio	(X^2) Conc. Ratio
7/10/2020	SCN982	PFOS	1	0.0181	0.02	0.00040
			2	0.0367	0.04	0.0016
			3	0.0751	0.08	0.0064
			4	0.1287	0.16	0.0256
			5	0.4089	0.40	0.1600
			6	0.8490	0.80	0.6400
			7	4.3716	4.00	16.0000
			8	8.7038	8.00	64.0000
			9	21.4254	20.00	400.0000
			10	38.6788	40.00	1600.0000

Regression Output	Calculated		Reported	
Constant	c	-0.06963	c	-0.0940027
Std Err of Y Est				
Degrees of Freedom				
	b	a	b	a
X Coefficient(s)	1.153191	-0.0046289	1.126310	-0.0003080400
Std Err of Coef.				
Correlation Coefficient		0.999967		
Coefficient of Determination (r^2)		0.999933		0.999556

LDC #: 48792 c96

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Calculation Verification

Reviewer: SC
2nd Reviewer:

Method: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (aveRRF - RRF)/aveRRF
RRF = (Ax)(Cis)/(Ais)(Cx)

Where:
aveRRF = initial calib average RRF
RRF = continuing calib RRF
Ax = Area of compound
Cx = Concentration of compound,
Ais = Area of associated internal standard
Cis = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (IS)	Conc	Reported Conc	Recalculated Conc	Reported %R	Recalculated %R
1	200710M1_109	7/11/2020	PFOA (13C2-PFOA)	10.00	10.7	10.7	106.5	106.5
			PFOS (13C8-PFOS)	10.00	8.57	8.55	85.7	85.5
2			PFOA (13C2-PFOA)					
			PFOS (13C8-PFOS)					
3			PFOA (13C2-PFOA)					
			PFOS (13C8-PFOS)					
4			PFOA (13C2-PFOA)					
			PFOS (13C8-PFOS)					
5			PFOA (13C2-PFOA)					
			PFOS (13C8-PFOS)					
6			PFOA (13C2-PFOA)					
			PFOS (13C8-PFOS)					

LDC #: 48792C96

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: SC
2nd Reviewer:

Method: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

Calibration Date	Instrument	Compound	Standard	(Y) Response ratio	(X) Conc. Ratio	(X^2) Conc. Ratio
7/16/2020	SCN945/960	PFOA	1	0.0307	0.02	0.00040
			2	0.0628	0.04	0.0016
			3	0.1341	0.08	0.0064
			4	0.2594	0.16	0.0256
			5	0.5827	0.40	0.1600
			6	1.2264	0.80	0.6400
			7	6.2227	4.00	16.0000
			8	11.8314	8.00	64.0000
			9	27.9818	20.00	400.0000
			10	55.1083	40.00	1600.0000

Regression Output	Calculated		Reported	
Constant	c	0.09022	c	0.0619264
Std Err of Y Est				
Degrees of Freedom				
	b	a	b	a
X Coefficient(s)	1.45746	-0.0020386	1.49503	-0.000249651
Std Err of Coef.				
Correlation Coefficient		0.999949		
Coefficient of Determination (r^2)		0.999898		0.99964

LDC #: 48792C9v

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: SC
2nd Reviewer: [illegible]

Method: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

Calibration Date	Instrument	Compound	Standard	(Y) Response ratio	(X) Conc. Ratio	(X^2) Conc. Ratio
7/16/2020	SCN982	PFOS	1	0.0183	0.02	0.00040
			2	0.0368	0.04	0.0016
			3	0.0855	0.08	0.0064
			4	0.1639	0.16	0.0256
			5	0.4212	0.40	0.1600
			6	0.8879	0.80	0.6400
			7	4.2126	4.00	16.0000
			8	8.8898	8.00	64.0000
			9	20.8350	20.00	400.0000
			10	37.5574	40.00	1600.0000

Regression Output	Calculated		Reported	
Constant	c	-0.03856	c	-0.0882230
Std Err of Y Est				
Degrees of Freedom				
	b	a	b	a
X Coefficient(s)	1.14010	-0.0050221	1.12687	-0.0003708350
Std Err of Coef.				
Correlation Coefficient		0.999978		
Coefficient of Determination (r^2)		0.999957		0.999734

LDC #: 48792C96

VALIDATION FINDINGS WORKSHEET
LCS Results Verification

Reviewer: SC
2nd Reviewer: CJ

Method: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

The percent recoveries (%R) and relative percent differences (RPD) of the laboratory control sample and laboratory control duplicate were recalculated for the compounds identified below using the following calculation:

SSC = (Area spike) (Conc IS) / (Area IS) (average RRF spike)
%Recovery = 100 * SSC/SA

Where:
SSC = Spiked concentration
SA = Spike added
LCS = Laboratory control spike recovery
LCSD = Laboratory control spike duplicate recovery

RPD = | LCS - LCSD | * 2/(LCS + LCSD)

LCS/LCSD ID: B0G0039-BS/D

Compound	SA (ug/L)		SSC (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalc.
PFOA	0.0400	0.0400	0.0431	0.0411	108	108	103	103	4.76	4.75
PFOS	0.0400	0.0400	0.0397	0.0398	99.1	99.3	99.4	99.5	0.260	0.252

LDC #: 48792096

VALIDATION FINDINGS WORKSHEET
Sample Results Verification

Reviewer: SC
2nd Reviewer: 9

Method: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

Compound results for all Level IV samples reported with a positive detect were recalculated and verified using the following equation:

$$\text{Concentration} = \frac{(Ax)\,(Cis)\,(Vt)\,(DF)}{(Ais)\,(RRF)\,(Vo)}$$

Where:

Ax = Area or height of the peak for the compound to be measured
Ais = Area or height of the peak for the internal standard
Cis = Concentration of the internal standard
DF = Dilution factor
Vt = Volume of extract in milliliters (mL)
RRF = Average relative response factor
Vo = Volume of sample in liters (L)

Sample #	Compound	Ax	Ais	Cis	DF	RRF	Vt (mL)	Vo (L)	Calculated Concentration (ug/L)	Reported Concentration (ug/L)	% Diff
1	PFOS	4.907E+02	3.402E+03	12.5	1	curve	1	261.96	0.00643	0.00643	0

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: MCAS El Toro and Tustin PFAS

LDC Report Date: September 3, 2020

Parameters: Perfluoroalkyl & Polyfluoroalkyl Substances

Validation Level: Stage 4

Laboratory: Vista Analytical Laboratory

Sample Delivery Group (SDG): 2001436

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
TW21D-20200707	2001436-02	Water	07/07/20
TW09D-20200707	2001436-03	Water	07/07/20
TW22D-20200707	2001436-04	Water	07/07/20
TW23D-20200708	2001436-06	Water	07/08/20
TW24D-20200708	2001436-07	Water	07/08/20
TW17D-20200708	2001436-08	Water	07/08/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Sampling and Analysis Plan for Per- and Polyfluoroalkyl Substances in Groundwater in Carve-Outs 2, 5, 6, and 9 and Groundwater and Surface Water Near Operable Unit 3, Former Marine Corps Air Station Tustin, Tustin, California, with Addendum #02 to Final Sampling and Analysis Plan for Per- and Polyfluoroalkyl Substances Sampling for Groundwater Remedial Action at Operable Unit 3, Installation Restoration Program Site 1 (February 2020), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), and the DoD General Validation Guidelines (February 2018). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS) by Environmental Protection Agency (EPA) Method 537 Modified and LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

X The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Acceptance or rejection of the data should be decided by the project team, but exclusion of the data is recommended.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. LC/MS Instrument Performance Check

Instrument performance was checked and the requirements were met.

III. Initial Calibration and Initial Calibration Verification

Initial calibration was performed as required by the methods.

A curve fit, based on the initial calibration, was established for quantitation. The coefficient of determination (r^2) was greater than or equal to 0.990.

For each calibration standard, all compounds were within 70-130% of their true value.

The signal to noise (S/N) ratio was within validation criteria for all compounds.

Retention time windows were established as required by the methods.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds.

IV. Continuing Calibration and Instrument Sensitivity Check

Continuing calibration was performed at required frequencies.

The percent differences (%D) were less than or equal to 30.0% for all compounds.

The signal to noise (S/N) ratio was within validation criteria for all compounds.

The percent differences (%D) of the instrument sensitivity check (ISC) were less than or equal to 30.0% for all compounds.

Retention times of all compounds in the calibration standards were within the established retention time windows.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Samples EB05-20200707 and EB06-20200708 were identified as equipment blanks. No contaminants were found.

VII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VIII. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Labeled Compounds

All percent recoveries (%R) for labeled compounds used to quantitate target compounds were within QC limits with the following exceptions:

Sample	Labeled Compound	%R (Limits)	Affected Compound	Flag	A or P
TW21D-20200707	13C2-PFTeDA	32.1 (50-150)	PFTeDA	NA	-
TW09D-20200707	d5-EtFOSAA 13C2-PFDoA 13C2-PFTeDA	42.0 (50-150) 38.5 (50-150) 11.4 (50-150)	EtFOSAA PFDoA PFTrDA 11Cl-PF30UdS PFTeDA	NA	-
TW22D-20200707	d3-MeFOSAA 13C2-PFUnA d5-EtFOSAA 13C2-PFDoA	30.9 (50-150) 35.7 (50-150) 23.3 (50-150) 13.5 (50-150)	MeFOSAA PFUnA EtFOSAA PFDoA PFTrDA 11Cl-PF30UdS	NA	-
TW22D-20200707	13C2-PFTeDA	6.30 (50-150)	PFTeDA	X	P
TW23D-20200708	d5-EtFOSAA 13C2-PFDoA	48.0 (50-150) 35.0 (50-150)	EtFOSAA PFDoA PFTrDA 11Cl-PF30UdS	NA	-
TW23D-20200708	13C2-PFTeDA	5.40 (50-150)	PFTeDA	X	P

Sample	Labeled Compound	%R (Limits)	Affected Compound	Flag	A or P
TW24D-20200708	13C2-PFDoA	45.9 (50-150)	PFDoA PFTrDA 11Cl-PF30UdS	NA	-
TW24D-20200708	13C2-PFTeDA	7.80 (50-150)	PFTeDA	X	P
TW17D-20200708	13C3-PFBS 13C2-PFHxA 13C4-PFHpA 13C3-PFHxS 13C5-PFNA 13C8-PFOS	44.4 (50-150) 42.2 (50-150) 45.2 (50-150) 44.2 (50-150) 41.9 (50-150) 45.5 (50-150)	PFBS PFHxA PFHpA PFHxS PFNA PFOS	J (all detects) J (all detects) J (all detects) J (all detects) J (all detects) J (all detects)	P
TW17D-20200708	13C3-HFPO-DA 13C4-PFHpA 13C8-PFOS 13C2-PFDA D3-MeFOSAA 13C2-PFUnA D5-EtFOSAA 13C2-PFDoA	39.6 (50-150) 45.2 (50-150) 45.5 (50-150) 39.0 (50-150) 27.8 (50-150) 28.3 (50-150) 22.3 (50-150) 15.3 (50-150)	HFPO-DA ADONA 9Cl-PF30NS PFDA MeFOSAA PFUnA EtFOSAA PFDoA PFTrDA 11Cl-PF30UdS	NA	-
TW17D-20200708	13C2-PFTeDA	3.30 (50-150)	PFTeDA	X	P

XI. Compound Quantitation

All compound quantitations met validation criteria.

XII. Target Compound Identifications

All target compound identifications met validation criteria.

XIII. System Performance

The system performance was acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to labeled compound %R, data were qualified for recommended exclusion in four samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable.

MCAS El Toro and Tustin PFAS
Perfluoroalkyl & Polyfluoroalkyl Substances - Data Qualification Summary - SDG 2001436

Sample	Compound	Flag	A or P	Reason
TW22D-20200707 TW23D-20200708 TW24D-20200708 TW17D-20200708	PFTeDA	X	P	Labeled compounds (%R)
TW17D-20200708	PFBS PFHxA PFHpA PFHxS PFNA PFOS	J (all detects) J (all detects) J (all detects) J (all detects) J (all detects) J (all detects)	P	Labeled compounds (%R)

MCAS El Toro and Tustin PFAS
Perfluoroalkyl & Polyfluoroalkyl Substances - Laboratory Blank Data Qualification Summary - SDG 2001436

No Sample Data Qualified in this SDG

MCAS El Toro and Tustin PFAS
Perfluoroalkyl & Polyfluoroalkyl Substances - Field Blank Data Qualification Summary - SDG 2001436

No Sample Data Qualified in this SDG

LDC #: 48792D96 **VALIDATION COMPLETENESS WORKSHEET** Date: 8/14/20

SDG #: 2001436 Stage 4 Page: 1 of 1

Laboratory: Vista Analytical Laboratory Reviewer: [illegible]

2nd Reviewer: [illegible]

METHOD: LC/MS Perfluoroalkyl & Polyfluoroalkyl Substances (EPA Method 537M/QSM 5.3 Table B-15)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	LC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / A	%r TV/ICV ≤ 30
IV.	Continuing calibration/ISC	A/A	D ≤ 30
V.	Laboratory Blanks	A	
VI.	Field blanks	ND	EB05-20200707, EB06-20200708
VII.	Matrix spike/Matrix spike duplicates	N	
VIII.	Laboratory control samples	A	LCSD
IX.	Field duplicates	N	
X.	Labeled Compounds	SW	
VI.	Compound quantitation RL/LOQ/LODs	A	
XII.	Target compound identification	A	
XIII.	System performance	A	
XIV.	Overall assessment of data	A	

Note: A = Acceptable ND = No compounds detected D = Duplicate SB=Source blank
N = Not provided/applicable R = Rinsate TB = Trip blank OTHER:
SW = See worksheet FB = Field blank EB = Equipment blank

	Client ID	Lab ID	Matrix	Date
1	TW21D-20200707	2001436-02	Water	07/07/20
2	TW09D-20200707	2001436-03	Water	07/07/20
3	TW22D-20200707	2001436-04	Water	07/07/20
4	TW23D-20200708	2001436-06	Water	07/08/20
5	TW24D-20200708	2001436-07	Water	07/08/20
6	TW17D-20200708	2001436-08	Water	07/08/20
7				
8				
9				
10				

Notes:

	B0G0058						

LDC #: 48192D96

VALIDATION FINDINGS CHECKLIST

Reviewer:
2nd Reviewer:

Method: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Were cooler temperature criteria met?	✓			
II. LC/MS Instrument performance check				
Were the instrument performance reviewed and found to be within the validation criteria?	✓			
III. Initial calibration and Initial calibration verification				
Did the laboratory perform a 5-point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20%?			✓	
Was a curve fit used for evaluation? If yes, did the initial calibration meet the coefficient of determination (r^2) criteria of ≥ 0.990?	✓			
Were all analytes within 70-130% or percent differences (%D) ≤30% of their true value for each calibration standard?	✓			
Was the signal to noise (S/N) ratio for all compounds within the validation criteria?	✓			
Were the retention time windows properly established?	✓			
Was an initial calibration verification (ICV) standard analyzed after each initial calibration for each instrument?	✓			
Were all ICV percent differences (%D) of the initial calibration verification ≤ 30%?	✓			
IV. Continuing calibration and Instrument sensitivity check				
Was a continuing calibration analyzed prior to sample analysis, after every 10 samples and at the end of the analytical sequence?	✓			
Were all percent differences (%D) of the continuing calibration ≤ 30%?	✓			
Were all the retention times within the acceptance windows?	✓			
Was the signal to noise (S/N) ratio for all compounds within the validation criteria?	✓			
Were all percent differences (%D) of the Instrument Sensitivity Check ≤ 30%?	✓			
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks?		✓		
VI. Field blanks				
Were field blanks identified in this SDG?	✓			
Were target compounds detected in the field blanks?		✓		

LDC #: 48792D96

VALIDATION FINDINGS CHECKLIST

Reviewer: [illegible]
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VII. Matrix spike/Matrix spike duplicates				
Were matrix spike (MS) and matrix spike duplicate (MSD) analyzed in this SDG?		✓		
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
VIII. Laboratory control samples				
Was an LCS analyzed per extraction batch for this SDG?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
IX. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
X. Labeled compounds				
Were labeled compound percent recoveries (%R) within the QC limits?	✓			
Were retention times within 0.4 minutes of the associated calibration standard?	✓			
XI. Compound quantitation				
Did the laboratory reporting limits (i.e. DL, LOD, LOQ) meet the QAPP?	✓			
Did reported results include both branched and linear isomers?	✓			
Were the correct ion transition, labeled compound and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound retention times within 0.1 minutes of the associated labeled compound for compounds with a labeled analog?	✓			
Were compound quantitation and reporting limits adjusted to reflect all sample dilutions and dry weight factors applicable to Stage 4 validation?	✓			
XII. Target compound identification				
Was the signal to noise (S/N) ratio for all compounds within the validation criteria?	✓			
Were two transitions and the ion transition ratio per analyte monitored and documented with the exception of PFBA and PFPeA?	✓			
Were ion ratios between 50-150%?	✓			
XIII. System performance				
System performance was found to be acceptable.	✓			
XIV. Overall assessment of Data				
Overall assessment of data was found to be acceptable.	✓			

TARGET COMPOUND WORKSHEET

METHOD: PFAS

A. PFBS		
B. PFHxA		
C. PFHpA		
D. PFHxS		
E. PFOA		
F. PFNA		
G. PFOS		
H. PFDA		
I. MeFOSAA		
J. EtFOSAA		
K. PFUnA		
L. PFDoA		
M. PFTrDA		
N. PFTeDA		
O. HFPO-DA		
P. ADONA		
Q. 9Cl-PF30NS		
R. 11Cl-PF30UdS		

LDC #: 48793D96

VALIDATION FINDINGS WORKSHEET
Labeled Compounds

Reviewer: [illegible]
2nd Reviewer: [illegible]

METHOD: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".
Y (N) N/A Were all labeled compound recoveries within the QC criteria?

#	Date	Lab ID/Reference	Labeled Compound	% Recovery (Limit)	Qualifications
		1 (ND)	TDA	32.1 (50-150)	J (all ts/p) (N)
		2	EFOS	42.0	(J)
			DDA	38.5	(L, M, R)
			TDA	11.4	
		3 (ND)	MFOS	30.9	(I)
			UDA	35.7	(k)
			EFOS	23.3	
			DDA	13.5	
			TDA	6.30	J (all ts/p) x/p
		4 (ND)	EFOS	48.0	J (all ts/p)
			DDA	35.0	
			TDA	5.40	J (all ts/p) x/p
		5 (ND)	DDA	45.9	J (all ts/p)
			TDA	7.80	J (all ts/p) x/p

BS = 13C3-PFBS HXS = 13C3-PFHxS OS = 13C8-PFOS TDA = 13C2-PFTeDA EFOS = d5-EtFOSAA
HXA = 13C2-PFHxA NA = 13C5-PFNA DA = 13C2-PFDA DDA = 13C2-PFDoA
HPA = 13C4-PFHpA OA = 13C2-PFOA UDA = 13C2-PFUnA MFOS = d3-MeFOSAA

LDC #: 48792D96

VALIDATION FINDINGS WORKSHEET
Labeled Compounds

Reviewer: [illegible]
2nd Reviewer: [illegible]

METHOD: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".
Y (N) N/A Were all labeled compound recoveries within the QC criteria?

#	Date	Lab ID/Reference	Labeled Compound	% Recovery (Limit)	Qualifications
		6 (dets/~~ND~~)	BS	44.4 (50-150)	J dets/P (A)
		(ND)	13C3-HFPO-DA	39.6	(O)
	~~C(dets), P(ND)~~	(dets)	HXA	42.2	(B)
	C(dets), P(ND)		HPA	45.2	(C, P)
		(dets)	HXS	44.2	(D)
		↓	NA	41.9	(F)
		↓	OA	47.8	No qual, 5x (E)
	G(dets), Q(ND)	~~(dets)~~	OS	45.5	J dets/P (G, Q)
		(ND)	DA	39.0	(H)
			MFOS	27.8	(I)
			UDA	28.3	(K)
			EFOS	22.3	(J)
		↓	DDA	15.3	(L, M, R)
		(ND)	TDA	3.30	~~J/X/P~~ ~~J~~ R/X/P (N)

BS = 13C3-PFBS HXS = 13C3-PFHxS OS = 13C8-PFOS TDA = 13C2-PFTeDA EFOS = d5-EtFOSAA
HXA = 13C2-PFHxA NA = 13C5-PFNA DA = 13C2-PFDA DDA = 13C2-PFDoA
HPA = 13C4-PFHpA OA = 13C2-PFOA UDA = 13C2-PFUnA MFOS = d3-MeFOSAA

LDC # 48792D96

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: SC
2nd Reviewer:

Method: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

Calibration Date	Instrument	Compound	Standard	(Y) Response ratio	(X) Conc. Ratio	(X^2) Conc. Ratio
7/14/2020	SCN977	PFOA	1	0.0152	0.02	0.00040
			2	0.0354	0.04	0.0016
			3	0.0774	0.08	0.0064
			4	0.1611	0.16	0.0256
			5	0.3921	0.40	0.1600
			6	0.7570	0.80	0.6400
			7	3.7452	4.00	16.0000
			8	7.3709	8.00	64.0000
			9	18.0513	20.00	400.0000
			10	35.0945	40.00	1600.0000

Regression Output	Calculated		Reported	
Constant	c	0.01292	c	-0.0058451
Std Err of Y Est				.
Degrees of Freedom				
	b	a	b	a
X Coefficient(s)	0.93049	-0.0013317	0.93654	-0.000120375
Std Err of Coef.				
Correlation Coefficient		0.999999		
Coefficient of Determination (r^2)		0.999998		0.999948

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Method: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

Calibration Date	Instrument	Compound	Standard	(Y) Response ratio	(X) Conc. Ratio	(X^2) Conc. Ratio
7/14/2020	SCN977	PFOS	1	0.0189	0.02	0.00040
			2	0.0436	0.04	0.0016
			3	0.0960	0.08	0.0064
			4	0.2164	0.16	0.0256
			5	0.4446	0.40	0.1600
			6	1.0272	0.80	0.6400
			7	5.1463	4.00	16.0000
			8	9.7792	8.00	64.0000
			9	23.9122	20.00	400.0000
			10	52.3992	40.00	1600.0000

Regression Output	Calculated		Reported	
Constant	c	0.11969	c	-0.0060877
Std Err of Y Est				
Degrees of Freedom				
	b	a	b	a
X Coefficient(s)	1.132454	0.0043764	1.186310	0.0002266170
Std Err of Coef.				
Correlation Coefficient		0.999890		
Coefficient of Determination (r^2)		0.999781		0.999166

LDC # 48792D96

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: SC
2nd Reviewer: 4

Method: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

Calibration Date	Instrument	Compound	Standard	(Y) Response ratio	(X) Conc. Ratio	(X^2) Conc. Ratio
7/15/2020	SCN977	PFOA	1	0.0206	0.02	0.00040
			2	0.0425	0.04	0.0016
			3	0.0812	0.08	0.0064
			4	0.1617	0.16	0.0256
			5	0.3638	0.40	0.1600
			6	0.7654	0.80	0.6400
			7	3.8409	4.00	16.0000
			8	7.7159	8.00	64.0000
			9	18.3778	20.00	400.0000
			10	33.7891	40.00	1600.0000

Regression Output	Calculated		Reported	
Constant	c	-0.01377	c	0.0065121
Std Err of Y Est				.
Degrees of Freedom				
	b	a	b	a
X Coefficient(s)	0.99146	-0.0036659	0.98500	-0.000278493
Std Err of Coef.				
Correlation Coefficient		0.999998		
Coefficient of Determination (r^2)		0.999996		0.999925

LDC #: 48792D96

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: SC
2nd Reviewer: A

Method: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

Calibration Date	Instrument	Compound	Standard	(Y) Response ratio	(X) Conc. Ratio	(X^2) Conc. Ratio
7/15/2020	SCN977	PFOS	1	0.0194	0.02	0.00040
			2	0.0507	0.04	0.0016
			3	0.0999	0.08	0.0064
			4	0.2036	0.16	0.0256
			5	0.5553	0.40	0.1600
			6	1.0030	0.80	0.6400
			7	5.2162	4.00	16.0000
			8	10.0225	8.00	64.0000
			9	22.5872	20.00	400.0000
			10	48.0572	40.00	1600.0000

Regression Output	Calculated		Reported	
Constant	c	0.17286	c	0.0162657
Std Err of Y Est				
Degrees of Freedom				
	b	a	b	a
X Coefficient(s)	1.138001	0.0014902	1.214650	-0.0000566898
Std Err of Coef.				
Correlation Coefficient		0.999708		
Coefficient of Determination (r^2)		0.999416		0.998321

LDC #: 48792D96

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Calculation Verification

Reviewer: SC
2nd Reviewer: A

Method: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (aveRRF - RRF)/aveRRF
RRF = (Ax)(Cis)/(Ais)(Cx)

Where:
aveRRF = initial calib average RRF
RRF = continuing calib RRF
Ax = Area of compound
Cx = Concentration of compound,
Ais = Area of associated internal standard
Cis = Concentration of internal standard

#	Standard ID	Calibration Date	Compound	(IS)	Conc	Reported Conc	Recalculated Conc	Reported %R	Recalculated %R
1	200714P1_42	7/15/2020	PFOA	(13C2-PFOA)	10.00	9.99	9.99	99.9	99.9
			PFOS	(13C8-PFOS)	10.00	10.70	10.75	107.2	107.5
2			PFOA	(13C2-PFOA)					
			PFOS	(13C8-PFOS)					
3			PFOA	(13C2-PFOA)					
			PFOS	(13C8-PFOS)					
4			PFOA	(13C2-PFOA)					
			PFOS	(13C8-PFOS)					
5			PFOA	(13C2-PFOA)					
			PFOS	(13C8-PFOS)					
6			PFOA	(13C2-PFOA)					
			PFOS	(13C8-PFOS)					

LDC #: 48792D96

VALIDATION FINDINGS WORKSHEET
LCS Results Verification

Reviewer: SC
2nd Reviewer:

Method: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

The percent recoveries (%R) and relative percent differences (RPD) of the laboratory control sample and laboratory control duplicate were recalculated for the compounds identified below using the following calculation:

SSC = (Area spike) (Conc IS) / (Area IS) (average RRF spike)
%Recovery = 100 * SSC/SA

Where:
SSC = Spiked concentration
SA = Spike added
LCS = Laboratory control spike recovery
LCSD = Laboratory control spike duplicate recovery

RPD = | LCS - LCSD | * 2/(LCS + LCSD)

LCS/LCSD ID: B0G0058-BS/D

Compound	SA (ug/L)		SSC (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalc.
PFOA	0.0400	0.0400	0.0380	0.0422	95.1	95.0	105	106	10.4	10.5
PFOS	0.0400	0.0400	0.0365	0.0485	91.2	91.3	121.0	121	28.4	28.2

LDC #: 48792B9C

VALIDATION FINDINGS WORKSHEET
Sample Results Verification

Reviewer: SC
2nd Reviewer:

Method: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

Compound results for all Level IV samples reported with a positive detect were recalculated and verified using the following equation:

$$\text{Concentration} = \frac{(Ax)\,(Cis)\,(Vt)\,(DF)}{(Ais)\,(RRF)\,(Vo)}$$

Where:

Ax = Area or height of the peak for the compound to be measured
Ais = Area or height of the peak for the internal standard
Cis = Concentration of the internal standard
DF = Dilution factor
Vt = Volume of extract in milliters (mL)
RRF = Average relative response factor
Vo = Volume of sample in liters (L)

Sample #	Compound	Ax	Ais	Cis	DF	RRF	Vt (mL)	Vo (L)	Calculated Concentration (ug/L)	Reported Concentration (ug/L)	% Diff
1	PFOA	4.611E+03	1.596E+04	12.5	1	curve	1	246.85	0.0157	0.0157	0

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: MCAS El Toro and Tustin PFAS

LDC Report Date: September 3, 2020

Parameters: Perfluoroalkyl & Polyfluoroalkyl Substances

Validation Level: Stage 4

Laboratory: Vista Analytical Laboratory

Sample Delivery Group (SDG): 2001444

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
TW27S-20200709	2001444-02	Water	07/09/20
TW22S-20200709	2001444-03	Water	07/09/20
TW10D-20200709	2001444-04	Water	07/09/20
TW11D-20200709	2001444-05	Water	07/09/20
TW12D-20200709	2001444-06	Water	07/09/20
TW13D-20200709	2001444-07	Water	07/09/20
TW14D-20200709	2001444-08	Water	07/09/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Sampling and Analysis Plan for Per- and Polyfluoroalkyl Substances in Groundwater in Carve-Outs 2, 5, 6, and 9 and Groundwater and Surface Water Near Operable Unit 3, Former Marine Corps Air Station Tustin, Tustin, California, with Addendum #02 to Final Sampling and Analysis Plan for Per- and Polyfluoroalkyl Substances Sampling for Groundwater Remedial Action at Operable Unit 3, Installation Restoration Program Site 1 (February 2020), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), and the DoD General Validation Guidelines (February 2018). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS) by Environmental Protection Agency (EPA) Method 537 Modified and LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

X The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Acceptance or rejection of the data should be decided by the project team, but exclusion of the data is recommended.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. LC/MS Instrument Performance Check

Instrument performance was checked and the requirements were met.

III. Initial Calibration and Initial Calibration Verification

Initial calibration was performed as required by the methods.

A curve fit, based on the initial calibration, was established for quantitation. The coefficient of determination (r^2) was greater than or equal to 0.990.

For each calibration standard, all compounds were within 70-130% of their true value.

The signal to noise (S/N) ratio was within validation criteria for all compounds.

Retention time windows were established as required by the methods.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds.

IV. Continuing Calibration and Instrument Sensitivity Check

Continuing calibration was performed at required frequencies.

The percent differences (%D) were less than or equal to 30.0% for all compounds.

The signal to noise (S/N) ratio was within validation criteria for all compounds.

The percent differences (%D) of the instrument sensitivity check (ISC) were less than or equal to 30.0% for all compounds.

Retention times of all compounds in the calibration standards were within the established retention time windows.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample EB07-20200709 was identified as an equipment blank. No contaminants were found.

VII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VIII. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Labeled Compounds

All percent recoveries (%R) for labeled compounds used to quantitate target compounds were within QC limits with the following exceptions:

Sample	Labeled Compound	%R (Limits)	Affected Compound	Flag	A or P
TW10D-20200709	13C2-PFTeDA	14.5 (50-150)	PFTeDA	NA	-
TW11D-20200709	d3-MeFOSAA 13C2-PFUnA d5-EtFOSAA 13C2-PFDoA	40.0 (50-150) 43.6 (50-150) 42.9 (50-150) 27.5 (50-150)	MeFOSAA EtFOSAA PFUnA PFDoA PFTrDA 11Cl-PF30UdS	NA	-
TW11D-20200709	13C2-PFTeDA	6.00 (50-150)	PFTeDA	X	P
TW12D-20200709	d3-MeFOSAA 13C2-PFUnA d5-EtFOSAA 13C2-PFDoA	44.9 (50-150) 42.9 (50-150) 41.2 (50-150) 24.1 (50-150)	MeFOSAA EtFOSAA PFUnA PFDoA PFTrDA 11Cl-PF30UdS	NA	-
TW12D-20200709	13C2-PFTeDA	5.20 (50-150)	PFTeDA	X	P
TW13D-20200709	13C2-PFTeDA	10.8 (50-150)	PFTeDA	NA	-

XI. Compound Quantitation

All compound quantitations met validation criteria.

XII. Target Compound Identifications

All target compound identifications met validation criteria with the following exceptions:

Sample	Compound	Ion Abundance Ratio (Limits)	Flag	A or P
TW13D-20200709	PFNA	26.223 (6.217-18.651)	J (all detects)	P

XIII. System Performance

The system performance was acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to labeled compound %R, data were qualified for recommended exclusion in two samples.

Due to labeled compounds %R and ion abundance ratio, data were qualified as estimated in one sample.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable.

MCAS El Toro and Tustin PFAS
Perfluoroalkyl & Polyfluoroalkyl Substances - Data Qualification Summary - SDG 2001444

Sample	Compound	Flag	A or P	Reason
TW11D-20200709 TW12D-20200709	PFTeDA	X	P	Labeled compounds (%R)
TW13D-20200709	PFNA	J (all detects)	P	Target compound identification (ion abundance ratio)

MCAS El Toro and Tustin PFAS
Perfluoroalkyl & Polyfluoroalkyl Substances - Laboratory Blank Data Qualification Summary - SDG 2001444

No Sample Data Qualified in this SDG

MCAS El Toro and Tustin PFAS
Perfluoroalkyl & Polyfluoroalkyl Substances - Field Blank Data Qualification Summary - SDG 2001444

No Sample Data Qualified in this SDG

LDC #: 48792E96 **VALIDATION COMPLETENESS WORKSHEET** Date: 8/14/20
SDG #: 2001444 Stage 4 Page: 1 of 1
Laboratory: Vista Analytical Laboratory Reviewer:
2nd Reviewer:

METHOD: LC/MS Perfluoroalkyl & Polyfluoroalkyl Substances (EPA Method 537M/QSM 5.3 Table B-15)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	LC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / A	r² TV/CV ≤ 30
IV.	Continuing calibration/ISC	A / A	≤ 30
V.	Laboratory Blanks	A	
VI.	Field blanks	ND	EB07-20200709
VII.	Matrix spike/Matrix spike duplicates	N	
VIII.	Laboratory control samples	A	LCS/D
IX.	Field duplicates	N	
X.	Labeled Compounds	SW	
VI.	Compound quantitation RL/LOQ/LODs	A	
XII.	Target compound identification	SW	
XIII.	System performance	A	
XIV.	Overall assessment of data	A	

Note: A = Acceptable ND = No compounds detected D = Duplicate SB=Source blank
N = Not provided/applicable R = Rinsate TB = Trip blank OTHER:
SW = See worksheet FB = Field blank EB = Equipment blank

	Client ID	Lab ID	Matrix	Date
1	TW27S-20200709	2001444-02	Water	07/09/20
2	TW22S-20200709	2001444-03	Water	07/09/20
3	TW10D-20200709	2001444-04	Water	07/09/20
4	TW11D-20200709	2001444-05	Water	07/09/20
5	TW12D-20200709	2001444-06	Water	07/09/20
6	TW13D-20200709	2001444-07	Water	07/09/20
7	TW14D-20200709	2001444-08	Water	07/09/20
8				
9				
10				

Notes:

	BOG0090						

LDC #: 48792E96

VALIDATION FINDINGS CHECKLIST

Reviewer:
2nd Reviewer:

Method: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Were cooler temperature criteria met?	✓			
II. LC/MS Instrument performance check				
Were the instrument performance reviewed and found to be within the validation criteria?	✓			
III. Initial calibration and Initial calibration verification				
Did the laboratory perform a 5-point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) $\leq$ 20%?			✓	
Was a curve fit used for evaluation? If yes, did the initial calibration meet the coefficient of determination (r^2) criteria of $\geq$ 0.990?	✓			
Were all analytes within 70-130% or percent differences (%D) $\leq$30% of their true value for each calibration standard?	✓			
Was the signal to noise (S/N) ratio for all compounds within the validation criteria?	✓			
Were the retention time windows properly established?	✓			
Was an initial calibration verification (ICV) standard analyzed after each initial calibration for each instrument?	✓			
Were all ICV percent differences (%D) of the initial calibration verification $\leq$ 30%?	✓			
IV. Continuing calibration and Instrument sensitivity check				
Was a continuing calibration analyzed prior to sample analysis, after every 10 samples and at the end of the analytical sequence?	✓			
Were all percent differences (%D) of the continuing calibration $\leq$ 30%?	✓			
Were all the retention times within the acceptance windows?	✓			
Was the signal to noise (S/N) ratio for all compounds within the validation criteria?	✓			
Were all percent differences (%D) of the Instrument Sensitivity Check $\leq$ 30%?	✓			
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks?		✓		
VI. Field blanks				
Were field blanks identified in this SDG?	✓			
Were target compounds detected in the field blanks?		✓		

LDC #: 48792E96

VALIDATION FINDINGS CHECKLIST

Reviewer: MK
2nd Reviewer:

Validation Area	Yes	No	NA	Findings/Comments
VII. Matrix spike/Matrix spike duplicates				
Were matrix spike (MS) and matrix spike duplicate (MSD) analyzed in this SDG?		✓		
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
VIII. Laboratory control samples				
Was an LCS analyzed per extraction batch for this SDG?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
IX. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
X. Labeled compounds				
Were labeled compound percent recoveries (%R) within the QC limits?		✓		
Were retention times within 0.4 minutes of the associated calibration standard?	✓			
XI. Compound quantitation				
Did the laboratory reporting limits (i.e. DL, LOD, LOQ) meet the QAPP?	✓			
Did reported results include both branched and linear isomers?	✓			
Were the correct ion transition, labeled compound and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound retention times within 0.1 minutes of the associated labeled compound for compounds with a labeled analog?	✓			
Were compound quantitation and reporting limits adjusted to reflect all sample dilutions and dry weight factors applicable to Stage 4 validation?	✓			
XII. Target compound identification				
Was the signal to noise (S/N) ratio for all compounds within the validation criteria?	✓			
Were two transitions and the ion transition ratio per analyte monitored and documented with the exception of PFBA and PFPeA?	✓			
Were ion ratios between 50-150%?		✓		
XIII. System performance				
System performance was found to be acceptable.	✓			
XIV. Overall assessment of Data				
Overall assessment of data was found to be acceptable.	✓			

TARGET COMPOUND WORKSHEET

METHOD: PFAS

A. PFBS		
B. PFHxA		
C. PFHpA		
D. PFHxS		
E. PFOA		
F. PFNA		
G. PFOS		
H. PFDA		
I. MeFOSAA		
J. EtFOSAA		
K. PFUnA		
L. PFDoA		
M. PFTrDA		
N. PFTeDA		
O. HFPO-DA		
P. ADONA		
Q. 9Cl-PF30NS		
R. 11Cl-PF30UdS		

LDC #: 48792E96

VALIDATION FINDINGS WORKSHEET
Labeled Compounds

Reviewer: M
2nd Reviewer: A

METHOD: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".
Y (N) N/A Were all labeled compound recoveries within the QC criteria?

#	Date	Lab ID/Reference	Labeled Compound	% Recovery (Limit)	Qualifications
		3 (NB)	TDA	14.5 (50-150)	Jdets/P (N)
		4 (NB)	MFOS	40.0	(I)
			UDA	43.6	(K)
			EFOS	42.9	(J)
			DDA	27.5	(L, M, R)
			TDA	6.00	~~J-det/P~~ ~~J-det/P~~
		5 (NB)	MFOS	44.9	Jdets/P
			UDA	42.9	
			EFOS	41.2	
			DDA	24.1	
			TDA	5.20	~~J-det/P~~ ~~J-det/P~~
		6 (NB)	TDA	10.8	Jdets/P

BS = 13C3-PFBS HXS = 13C3-PFHxS OS = 13C8-PFOS TDA = 13C2-PFTeDA EFOS = d5-EtFOSAA
HXA = 13C2-PFHxA NA = 13C5-PFNA DA = 13C2-PFDA DDA = 13C2-PFDoA
HPA = 13C4-PFHpA OA = 13C2-PFOA UDA = 13C2-PFUnA MFOS = d3-MeFOSAA

LDC #: 48792E96

VALIDATION FINDINGS WORKSHEET
Target Compound Identification

Page: 1 of 1
Reviewer: [illegible]
2nd Reviewer: [illegible]

METHOD: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

M N N/A Was the signal to noise (S/N) ratio for all compounds within the validation criteria?
Y N N/A Were two transitions and the ion transition ratio per analyte monitored and documented with the exception of PFBA and PFPeA?
Y N N/A Were ion ratios within QC limits and between 50-150%?

#	Date	Sample ID	Associated Compound	Ion ratio (%D≤50) limit	Qualifications
		6	F	26.223 (6.217-8.651)	Jdets/A

LDC # 48792E96

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: SC
2nd Reviewer: A

Method: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

Calibration Date	Instrument	Compound	Standard	(Y) Response ratio	(X) Conc. Ratio	(X^2) Conc. Ratio
7/21/2020	SCN977	PFOA	1	0.0278	0.02	0.00040
			2	0.0469	0.04	0.0016
			3	0.0823	0.08	0.0064
			4	0.1593	0.16	0.0256
			5	0.3971	0.40	0.1600
			6	0.7486	0.80	0.6400
			7	3.7233	4.00	16.0000
			8	7.8135	8.00	64.0000
			9	18.9803	20.00	400.0000
			10	36.5156	40.00	1600.0000

Regression Output	Calculated		Reported	
Constant	c	-0.01706	c	0.0565111
Std Err of Y Est				
Degrees of Freedom				
	b	a	b	a
X Coefficient(s)	0.98243	-0.0017341	0.972216	-0.000115660
Std Err of Coef.				
Correlation Coefficient		0.999989		
Coefficient of Determination (r^2)		0.999978		0.999818

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Method: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

Calibration Date	Instrument	Compound	Standard	(Y) Response ratio	(X) Conc. Ratio	(X^2) Conc. Ratio
7/21/2020	SCN977	PFOS	1	0.0210	0.02	0.00040
			2	0.0340	0.04	0.0016
			3	0.1120	0.08	0.0064
			4	0.1911	0.16	0.0256
			5	0.5292	0.40	0.1600
			6	0.9517	0.80	0.6400
			7	5.0005	4.00	16.0000
			8	10.7860	8.00	64.0000
			9	25.6408	20.00	400.0000
			10	52.0437	40.00	1600.0000

Regression Output	Calculated		Reported	
Constant	c	0.00376	c	-0.0631930
Std Err of Y Est				
Degrees of Freedom				
	b	a	b	a
X Coefficient(s)	1.287640	0.0003101	1.292200	0.0000147461
Std Err of Coef.				
Correlation Coefficient		0.999957		
Coefficient of Determination (r^2)		0.999913		0.99958

LDC # 48792E96

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: SC
2nd Reviewer:

Method: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

Calibration Date	Instrument	Compound	Standard	(Y) Response ratio	(X) Conc. Ratio	(X^2) Conc. Ratio
7/23/2020	SCN977	PFOA	1	0.0232	0.02	0.00040
			2	0.0463	0.04	0.0016
			3	0.0863	0.08	0.0064
			4	0.1615	0.16	0.0256
			5	0.3900	0.40	0.1600
			6	0.7723	0.80	0.6400
			7	3.8020	4.00	16.0000
			8	7.3944	8.00	64.0000
			9	19.1260	20.00	400.0000
			10	36.7968	40.00	1600.0000

Regression Output	Calculated		Reported	
Constant	c	-0.02577	c	0.0499833
Std Err of Y Est				
Degrees of Freedom				
	b	a	b	a
X Coefficient(s)	0.97078	-0.0012466	0.956964	-0.0000683589
Std Err of Coef.				
Correlation Coefficient		0.999962		
Coefficient of Determination (r^2)		0.999925		0.999795

LDC #: 48792E96

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: SC
2nd Reviewer:

Method: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

Calibration Date	Instrument	Compound	Standard	(Y) Response ratio	(X) Conc. Ratio	(X^2) Conc. Ratio
7/23/2020	SCN977	PFOS	1	0.0175	0.02	0.00040
			2	0.0388	0.04	0.0016
			3	0.1035	0.08	0.0064
			4	0.2072	0.16	0.0256
			5	0.5466	0.40	0.1600
			6	0.8809	0.80	0.6400
			7	5.1093	4.00	16.0000
			8	9.5918	8.00	64.0000
			9	25.5339	20.00	400.0000
			10	60.0403	40.00	1600.0000

Regression Output	Calculated		Reported	
Constant	c	0.10878	c	0.0102665
Std Err of Y Est				
Degrees of Freedom				
	b	a	b	a
X Coefficient(s)	1.089828	0.0102330	1.138060	0.0007079480
Std Err of Coef.				
Correlation Coefficient		0.999939		
Coefficient of Determination (r^2)		0.999877		0.999249

LDC # 48792E96

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: SC
2nd Reviewer:

Method: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

Calibration Date	Instrument	Compound	Standard	(Y) Response ratio	(X) Conc. Ratio	(X^2) Conc. Ratio
7/24/2020	SCN977	PFOA	1	0.0257	0.02	0.00040
			2	0.0357	0.04	0.0016
			3	0.0821	0.08	0.0064
			4	0.1614	0.16	0.0256
			5	0.4081	0.40	0.1600
			6	0.7089	0.80	0.6400
			7	3.6827	4.00	16.0000
			8	7.6180	8.00	64.0000
			9	19.7474	20.00	400.0000
			10	38.9385	40.00	1600.0000

Regression Output	Calculated		Reported	
Constant	c	-0.04915	c	0.0306828
Std Err of Y Est				
Degrees of Freedom				
	b	a	b	a
X Coefficient(s)	0.97842	-0.0000964	0.955014	0.0000457658
Std Err of Coef.				
Correlation Coefficient		0.999962		
Coefficient of Determination (r^2)		0.999925		0.999663

LDC #: 48792E96

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: SC
2nd Reviewer:

Method: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

Calibration Date	Instrument	Compound	Standard	(Y) Response ratio	(X) Conc. Ratio	(X^2) Conc. Ratio
7/24/2020	SCN977	PFOS	1	0.0154	0.02	0.00040
			2	0.0500	0.04	0.0016
			3	0.0828	0.08	0.0064
			4	0.2236	0.16	0.0256
			5	0.4951	0.40	0.1600
			6	0.9308	0.80	0.6400
			7	4.7375	4.00	16.0000
			8	9.4045	8.00	64.0000
			9	27.8957	20.00	400.0000
			10	50.8200	40.00	1600.0000

Regression Output	Calculated		Reported	
Constant	c	-0.24946	c	-0.0790602
Std Err of Y Est				
Degrees of Freedom				
	b	a	b	a
X Coefficient(s)	1.386808	-0.0027533	1.278740	0.0000281280
Std Err of Coef.				
Correlation Coefficient		0.999343		
Coefficient of Determination (r^2)		0.998686		0.996689

LDC #: 48792E96

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Calculation Verification

Reviewer: SC
2nd Reviewer:

Method: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (aveRRF - RRF)/aveRRF
RRF = (Ax)(Cis)/(Ais)(Cx)

Where:
aveRRF = initial calib average RRF
RRF = continuing calib RRF
Ax = Area of compound
Cx = Concentration of compound,
Ais = Area of associated internal standard
Cis = Concentration of internal standard

#	Standard ID	Calibration Date	Compound	(IS)	Conc	Reported Conc	Recalculated Conc	Reported %R	Recalculated %R
1	200721P1_38	7/21/2020	PFOA	(13C2-PFOA)	10.00	9.17	9.17	91.7	91.7
			PFOS	(13C8-PFOS)	10.00	9.15	9.16	91.5	91.6
2	200724P1_48	7/24/2020	PFOA	(13C2-PFOA)	10.00	9.37	9.35	93.7	93.5
			PFOS	(13C8-PFOS)	10.00	9.19	9.19	91.9	91.9
3			PFOA	(13C2-PFOA)					
			PFOS	(13C8-PFOS)					
4			PFOA	(13C2-PFOA)					
			PFOS	(13C8-PFOS)					
5			PFOA	(13C2-PFOA)					
			PFOS	(13C8-PFOS)					
6			PFOA	(13C2-PFOA)					
			PFOS	(13C8-PFOS)					

LDC #: 48792E96

VALIDATION FINDINGS WORKSHEET
LCS Results Verification

Reviewer: SC
2nd Reviewer:

Method: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

The percent recoveries (%R) and relative percent differences (RPD) of the laboratory control sample and laboratory control duplicate were recalculated for the compounds identified below using the following calculation:

SSC = (Area spike) (Conc IS) / (Area IS) (average RRF spike)
%Recovery = 100 * SSC/SA

Where:
SSC = Spiked concentration
SA = Spike added
LCS = Laboratory control spike recovery
LCSD = Laboratory control spike duplicate recovery

RPD = | LCS - LCSD | * 2/(LCS + LCSD)

LCS/LCSD ID: B0G0090-BS/D

Compound	SA (ug/L)		SSC (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalc.
PFOA	0.0400	0.0400	0.0381	0.0380	95.3	95.3	94.9	95.0	0.339	0.263
PFOS	0.0400	0.0400	0.0417	0.0357	104	104	89.2	89.3	15.6	15.5

LDC #: 48792E96

VALIDATION FINDINGS WORKSHEET
Sample Results Verification

Reviewer: SC
2nd Reviewer:

Method: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

Compound results for all Level IV samples reported with a positive detect were recalculated and verified using the following equation:

$$\text{Concentration} = \frac{(Ax)\,(Cis)\,(Vt)\,(DF)}{(Ais)\,(RRF)\,(Vo)}$$

Where:

Ax = Area or height of the peak for the compound to be measured
Ais = Area or height of the peak for the internal standard
Cis = Concentration of the internal standard
DF = Dilution factor
Vt = Volume of extract in milliliters (mL)
RRF = Average relative response factor
Vo = Volume of sample in liters (L)

Sample #	Compound	Ax	Ais	Cis	DF	RRF	Vt (mL)	Vo (mL)	Calculated Concentration (ug/L)	Reported Concentration (ug/L)	% Diff
1	PFOS	5.300E+04	1.611E+02	12.5	15	curve	1	247.75	12.2	12.2	0

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: MCAS El Toro and Tustin PFAS

LDC Report Date: September 3, 2020

Parameters: Perfluoroalkyl & Polyfluoroalkyl Substances

Validation Level: Stage 4

Laboratory: Vista Analytical Laboratory

Sample Delivery Group (SDG): 2001472

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
TW23S-20200710	2001472-02	Water	07/10/20
TW24S-20200710	2001472-03	Water	07/10/20
TW15D-20200710	2001472-04	Water	07/10/20
TW16D-20200710	2001472-05	Water	07/10/20

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Sampling and Analysis Plan for Per- and Polyfluoroalkyl Substances in Groundwater in Carve-Outs 2, 5, 6, and 9 and Groundwater and Surface Water Near Operable Unit 3, Former Marine Corps Air Station Tustin, Tustin, California, with Addendum #02 to Final Sampling and Analysis Plan for Per- and Polyfluoroalkyl Substances Sampling for Groundwater Remedial Action at Operable Unit 3, Installation Restoration Program Site 1 (February 2020), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), and the DoD General Validation Guidelines (February 2018). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS) by Environmental Protection Agency (EPA) Method 537 Modified and LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

All sample results were subjected to Stage 4 data validation, which is comprised of the quality control (QC) summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

X The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Acceptance or rejection of the data should be decided by the project team, but exclusion of the data is recommended.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. LC/MS Instrument Performance Check

Instrument performance was checked and the requirements were met.

III. Initial Calibration and Initial Calibration Verification

Initial calibration was performed as required by the methods.

A curve fit, based on the initial calibration, was established for quantitation. The coefficient of determination (r^2) was greater than or equal to 0.990.

For each calibration standard, all compounds were within 70-130% of their true value.

The signal to noise (S/N) ratio was within validation criteria for all compounds.

Retention time windows were established as required by the methods.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds.

IV. Continuing Calibration and Instrument Sensitivity Check

Continuing calibration was performed at required frequencies.

The percent differences (%D) were less than or equal to 30.0% for all compounds.

The signal to noise (S/N) ratio was within validation criteria for all compounds.

The percent differences (%D) of the instrument sensitivity check (ISC) were less than or equal to 30.0% for all compounds.

Retention times of all compounds in the calibration standards were within the established retention time windows.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample 08-2020710 was identified as an equipment blank. No contaminants were found.

VII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VIII. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Labeled Compounds

All percent recoveries (%R) for labeled compounds used to quantitate target compounds were within QC limits with the following exceptions:

Sample	Labeled Compound	%R (Limits)	Affected Compound	Flag	A or P
TW24S-20200710	13C2-PFTeDA	36.1 (50-150)	PFTeDA	NA	-
TW15D-20200710	13C2-PFDoA	46.9 (50-150)	PFDoA PFTrDA 11Cl-PF30UdS	NA	-
TW15D-20200710	13C2-PFTeDA	6.90 (50-150)	PFTeDA	X	P
TW16D-20200710	d3-MeFOSAA 13C2-PFUnA d5-EtFOSAA 13C2-PFDoA	49.9 (50-150) 44.2 (50-150) 46.5 (50-150) 28.8 (50-150)	MeFOSAA PFUnA EtFOSAA PFDoA PFTrDA 11Cl-PF30UdS	NA	-
TW16D-20200710	13C2-PFTeDA	5.50 (50-150)	PFTeDA	X	P

XI. Compound Quantitation

All compound quantitations met validation criteria.

XII. Target Compound Identifications

All target compound identifications met validation criteria.

XIII. System Performance

The system performance was acceptable.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to labeled compounds %R, data were qualified for recommended exclusion in two samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable

MCAS El Toro and Tustin PFAS
Perfluoroalkyl & Polyfluoroalkyl Substances - Data Qualification Summary - SDG 2001472

Sample	Compound	Flag	A or P	Reason
TW15D-20200710 TW16D-20200710	PFTeDA	X	P	Labeled compounds (%R)

MCAS El Toro and Tustin PFAS
Perfluoroalkyl & Polyfluoroalkyl Substances - Laboratory Blank Data Qualification Summary - SDG 2001472

No Sample Data Qualified in this SDG

MCAS El Toro and Tustin PFAS
Perfluoroalkyl & Polyfluoroalkyl Substances - Field Blank Data Qualification Summary - SDG 2001472

No Sample Data Qualified in this SDG

LDC #: 48792F96 **VALIDATION COMPLETENESS WORKSHEET** Date: 8/30/20
SDG #: 2001472 Stage 4 Page: 1 of 1
Laboratory: Vista Analytical Laboratory Reviewer: M
2nd Reviewer: G

METHOD: LC/MS Perfluoroalkyl & Polyfluoroalkyl Substances (EPA Method 537M/QSM 5.3 Table B-15)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	LC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / A	r TN/10/≤30
IV.	Continuing calibration/ISC	A/A	D≤30
V.	Laboratory Blanks	A	
VI.	Field blanks	ND	EB08-20200710
VII.	Matrix spike/Matrix spike duplicates	N	
VIII.	Laboratory control samples	A	LCS/D
IX.	Field duplicates	N	
X.	Labeled Compounds	SW	
VI.	Compound quantitation RL/LOQ/LODs	A	
XII.	Target compound identification	A	
XIII.	System performance	A	
XIV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	TW23S-20200710	2001472-02	Water	07/10/20
2	TW24S-20200710	2001472-03	Water	07/10/20
3	TW15D-20200710	2001472-04	Water	07/10/20
4	TW16D-20200710	2001472-05	Water	07/10/20
5				
6				
7				
8				
9				
10				

Notes:

	BoG0090						

LDC #: 48792F9C

VALIDATION FINDINGS CHECKLIST

Reviewer: N
2nd Reviewer:

Method: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Were cooler temperature criteria met?	✓			
II. LC/MS Instrument performance check				
Were the instrument performance reviewed and found to be within the validation criteria?	✓			
III. Initial calibration and Initial calibration verification				
Did the laboratory perform a 5-point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20%?			✓	
Was a curve fit used for evaluation? If yes, did the initial calibration meet the coefficient of determination (r^2) criteria of ≥ 0.990?	✓			
Were all analytes within 70-130% or percent differences (%D) ≤30% of their true value for each calibration standard?	✓			
Was the signal to noise (S/N) ratio for all compounds within the validation criteria?	✓			
Were the retention time windows properly established?	✓			
Was an initial calibration verification (ICV) standard analyzed after each initial calibration for each instrument?	✓			
Were all ICV percent differences (%D) of the initial calibration verification ≤ 30%?	✓			
IV. Continuing calibration and Instrument sensitivity check				
Was a continuing calibration analyzed prior to sample analysis, after every 10 samples and at the end of the analytical sequence?	✓			
Were all percent differences (%D) of the continuing calibration ≤ 30%?	✓			
Were all the retention times within the acceptance windows?	✓			
Was the signal to noise (S/N) ratio for all compounds within the validation criteria?	✓			
Were all percent differences (%D) of the Instrument Sensitivity Check ≤ 30%?	✓			
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks?		✓		
VI. Field blanks				
Were field blanks identified in this SDG?	✓			
Were target compounds detected in the field blanks?		✓		

LDC #: 48792F96

VALIDATION FINDINGS CHECKLIST

Reviewer: [illegible]
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VII. Matrix spike/Matrix spike duplicates				
Were matrix spike (MS) and matrix spike duplicate (MSD) analyzed in this SDG?		✓		
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
VIII. Laboratory control samples				
Was an LCS analyzed per extraction batch for this SDG?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
IX. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
X. Labeled compounds				
Were labeled compound percent recoveries (%R) within the QC limits?		✓		
Were retention times within 0.4 minutes of the associated calibration standard?	✓			
XI. Compound quantitation				
Did the laboratory reporting limits (i.e. DL, LOD, LOQ) meet the QAPP?	✓			
Did reported results include both branched and linear isomers?	✓			
Were the correct ion transition, labeled compound and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound retention times within 0.1 minutes of the associated labeled compound for compounds with a labeled analog?	✓			
Were compound quantitation and reporting limits adjusted to reflect all sample dilutions and dry weight factors applicable to Stage 4 validation?	✓			
XII. Target compound identification				
Was the signal to noise (S/N) ratio for all compounds within the validation criteria?	✓			
Were two transitions and the ion transition ratio per analyte monitored and documented with the exception of PFBA and PFPeA?	✓			
Were ion ratios between 50-150%?	✓			
XIII. System performance				
System performance was found to be acceptable.	✓			
XIV. Overall assessment of Data				
Overall assessment of data was found to be acceptable.	✓			

TARGET COMPOUND WORKSHEET

METHOD: PFAS

A. PFBS		
B. PFHxA		
C. PFHpA		
D. PFHxS		
E. PFOA		
F. PFNA		
G. PFOS		
H. PFDA		
I. MeFOSAA		
J. EtFOSAA		
K. PFUnA		
L. PFDoA		
M. PFTrDA		
N. PFTeDA		
O. HFPO-DA		
P. ADONA		
Q. 9Cl-PF30NS		
R. 11Cl-PF30UdS		

LDC #: 48792F96

VALIDATION FINDINGS WORKSHEET
Labeled Compounds

Page: 1 of 1
Reviewer:
2nd Reviewer:

METHOD: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y (N) N/A Were all labeled compound recoveries within the QC criteria?

#	Date	Lab ID/Reference	Labeled Compound	% Recovery (Limit)	Qualifications
		2 (ND)	TDA	36.1 (50-150)	J-dets/P (N)
		3	DDA	46.9	✓
			TDA	6.90	J/X/P
		4	MFOS	49.9	(I)
			UDA	44.2	(K)
			EFOS	46.5	(J)
			DDA	28.8	✓ (L, M, R)
			TDA	5.50	J/X/P (N)

BS = 13C3-PFBS HXS = 13C3-PFHxS OS = 13C8-PFOS TDA = 13C2-PFTeDA EFOS = d5-EtFOSAA
HXA = 13C2-PFHxA NA = 13C5-PFNA DA = 13C2-PFDA DDA = 13C2-PFDoA
HPA = 13C4-PFHpA OA = 13C2-PFOA UDA = 13C2-PFUnA MFOS = d3-MeFOSAA

LDC # 48792F96

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: SC
2nd Reviewer:

Method: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

Calibration Date	Instrument	Compound	Standard	(Y) Response ratio	(X) Conc. Ratio	(X^2) Conc. Ratio
7/21/2020	SCN977	PFOA	1	0.0278	0.02	0.00040
			2	0.0469	0.04	0.0016
			3	0.0823	0.08	0.0064
			4	0.1593	0.16	0.0256
			5	0.3971	0.40	0.1600
			6	0.7486	0.80	0.6400
			7	3.7233	4.00	16.0000
			8	7.8135	8.00	64.0000
			9	18.9803	20.00	400.0000
			10	36.5156	40.00	1600.0000

Regression Output	Calculated		Reported	
Constant	c	-0.01706	c	0.0565111
Std Err of Y Est				.
Degrees of Freedom				
	b	a	b	a
X Coefficient(s)	0.98243	-0.0017341	0.972216	-0.000115660
Std Err of Coef.				
Correlation Coefficient		0.999989		
Coefficient of Determination (r^2)		0.999978		0.999818

LDC #: 48792F96

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: SC
2nd Reviewer:

Method: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

Calibration Date	Instrument	Compound	Standard	(Y) Response ratio	(X) Conc. Ratio	(X^2) Conc. Ratio
7/21/2020	SCN977	PFOS	1	0.0210	0.02	0.00040
			2	0.0340	0.04	0.0016
			3	0.1120	0.08	0.0064
			4	0.1911	0.16	0.0256
			5	0.5292	0.40	0.1600
			6	0.9517	0.80	0.6400
			7	5.0005	4.00	16.0000
			8	10.7860	8.00	64.0000
			9	25.6408	20.00	400.0000
			10	52.0437	40.00	1600.0000

Regression Output	Calculated		Reported	
Constant	c	0.00376	c	-0.0631930
Std Err of Y Est				
Degrees of Freedom				
	b	a	b	a
X Coefficient(s)	1.287640	0.0003101	1.292200	0.0000147461
Std Err of Coef.				
Correlation Coefficient		0.999957		
Coefficient of Determination (r^2)		0.999913		0.99958

LDC # 48792F96

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: SC
2nd Reviewer:

Method: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

Calibration Date	Instrument	Compound	Standard	(Y) Response ratio	(X) Conc. Ratio	(X^2) Conc. Ratio
7/23/2020	SCN977	PFOA	1	0.0232	0.02	0.00040
			2	0.0463	0.04	0.0016
			3	0.0863	0.08	0.0064
			4	0.1615	0.16	0.0256
			5	0.3900	0.40	0.1600
			6	0.7723	0.80	0.6400
			7	3.8020	4.00	16.0000
			8	7.3944	8.00	64.0000
			9	19.1260	20.00	400.0000
			10	36.7968	40.00	1600.0000

Regression Output	Calculated		Reported	
Constant	c	-0.02577	c	0.0499833
Std Err of Y Est				
Degrees of Freedom				
	b	a	b	a
X Coefficient(s)	0.97078	-0.0012466	0.956964	-0.0000683589
Std Err of Coef.				
Correlation Coefficient		0.999962		
Coefficient of Determination (r^2)		0.999925		0.999795

LDC #: 48792F96

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: SC
2nd Reviewer:

Method: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

Calibration Date	Instrument	Compound	Standard	(Y) Response ratio	(X) Conc. Ratio	(X^2) Conc. Ratio
7/23/2020	SCN977	PFOS	1	0.0175	0.02	0.00040
			2	0.0388	0.04	0.0016
			3	0.1035	0.08	0.0064
			4	0.2072	0.16	0.0256
			5	0.5466	0.40	0.1600
			6	0.8809	0.80	0.6400
			7	5.1093	4.00	16.0000
			8	9.5918	8.00	64.0000
			9	25.5339	20.00	400.0000
			10	60.0403	40.00	1600.0000

Regression Output	Calculated		Reported	
Constant	c	0.10878	c	0.0102665
Std Err of Y Est				
Degrees of Freedom				
	b	a	b	a
X Coefficient(s)	1.089828	0.0102330	1.138060	0.0007079480
Std Err of Coef.				
Correlation Coefficient		0.999939		
Coefficient of Determination (r^2)		0.999877		0.999249

LDC #: 48792F9b

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Calculation Verification

Reviewer: SC
2nd Reviewer:

Method: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (aveRRF - RRF)/aveRRF
RRF = (Ax)(Cis)/(Ais)(Cx)

Where:
aveRRF = initial calib average RRF
RRF = continuing calib RRF
Ax = Area of compound
Cx = Concentration of compound,
Ais = Area of associated internal standard
Cis = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (IS)	Conc	Reported Conc	Recalculated Conc	Reported %R	Recalculated %R
1	200721P1_38	7/21/2020	PFOA (13C2-PFOA)	10.00	9.17	9.17	91.7	91.7
			PFOS (13C8-PFOS)	10.00	9.15	9.16	91.5	91.6
2			PFOA (13C2-PFOA)					
			PFOS (13C8-PFOS)					
3			PFOA (13C2-PFOA)					
			PFOS (13C8-PFOS)					
4			PFOA (13C2-PFOA)					
			PFOS (13C8-PFOS)					
5			PFOA (13C2-PFOA)					
			PFOS (13C8-PFOS)					
6			PFOA (13C2-PFOA)					
			PFOS (13C8-PFOS)					

LDC #: 4792F96

VALIDATION FINDINGS WORKSHEET
LCS Results Verification

Reviewer: SC
2nd Reviewer:

Method: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

The percent recoveries (%R) and relative percent differences (RPD) of the laboratory control sample and laboratory control duplicate were recalculated for the compounds identified below using the following calculation:

SSC = (Area spike) (Conc IS) / (Area IS) (average RRF spike)
%Recovery = 100 * SSC/SA

Where:
SSC = Spiked concentration
SA = Spike added
LCS = Laboratory control spike recovery
LCSD = Laboratory control spike duplicate recovery

RPD = | LCS - LCSD | * 2/(LCS + LCSD)

LCS/LCSD ID: B0G0090-BS/D

Compound	SA (ug/L)		SSC (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalc.
PFOA	0.0400	0.0400	0.0381	0.0380	95.3	95.3	94.9	95.0	0.339	0.263
PFOS	0.0400	0.0400	0.0417	0.0357	104	104	89.2	89.3	15.6	15.5

LDC #: 48792F96

VALIDATION FINDINGS WORKSHEET
Sample Results Verification

Reviewer: SC
2nd Reviewer:

Method: LC/MS/MS and Isotope Dilution Compliant with Table B-15 of DoD QSM 5.3

Compound results for all Level IV samples reported with a positive detect were recalculated and verified using the following equation:

$$\text{Concentration} = \frac{(Ax)\,(Cis)\,(Vt)\,(DF)}{(Ais)\,(RRF)\,(Vo)}$$

Where:

Ax = Area or height of the peak for the compound to be measured
Ais = Area or height of the peak for the internal standard
Cis = Concentration of the internal standard
DF = Dilution factor
Vt = Volume of extract in milliters (mL)
RRF = Average relative response factor
Vo = Volume of sample in liters (L)

Sample #	Compound	Ax	Ais	Cis	DF	RRF	Vt (mL)	Vo (mL)	Calculated Concentration (ug/L)	Reported Concentration (ug/L)	% Diff
1	PFOA	3.013E+05	1.304E+03	12.5	10	curve	1	241.84	18.2	18.2	0

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TUSTIN_MCAS	OU 0000001B NORTH	TW14D	Temporary well point	6083953.436	2206282.865	TW14D-20200709	Ground water	9-Jul-20	Perfluoroalkyl Compounds	2001444
TUSTIN_MCAS	OU 0000001B SOUTH	TW12D	Temporary well point	6082282.44	2204051.192	TW12D-20200709	Ground water	9-Jul-20	Perfluoroalkyl Compounds	2001444
TUSTIN_MCAS	OU 0000001B SOUTH	TW22S	Temporary well point	6082601.688	2203498.64	TW22S-20200709	Ground water	9-Jul-20	Perfluoroalkyl Compounds	2001444
TUSTIN_MCAS	OU 0000001B SOUTH	TW10D	Temporary well point	6081450.272	2204907.697	TW10D-20200709	Ground water	9-Jul-20	Perfluoroalkyl Compounds	2001444
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TUSTIN_MCAS	OU 0000004B	TW27S	Temporary well point	6083095.369	2204827.441	TW27S-20200709	Ground water	9-Jul-20	Perfluoroalkyl Compounds	2001444
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TUSTIN_MCAS	OU 0000001B SOUTH	TW11D	Temporary well point	6081828.142	2204805.966	TW11D-20200709	Ground water	9-Jul-20	Perfluoroalkyl Compounds	2001444
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TUSTIN_MCAS	OU 0000004B	TW27S	Temporary well point	6083095.369	2204827.441	TW27S-20200709	Ground water	9-Jul-20	Perfluoroalkyl Compounds	2001444
TUSTIN_MCAS	OU 0000001B SOUTH	TW22S	Temporary well point	6082601.688	2203498.64	TW22S-20200709	Ground water	9-Jul-20	Perfluoroalkyl Compounds	2001444
TUSTIN_MCAS	OU 0000001B SOUTH	TW13D	Temporary well point	6082758.053	2204340.858	TW13D-20200709	Ground water	9-Jul-20	Perfluoroalkyl Compounds	2001444
TUSTIN_MCAS	OU 0000001B SOUTH	TW13D	Temporary well point	6082758.053	2204340.858	TW13D-20200709	Ground water	9-Jul-20	Perfluoroalkyl Compounds	2001444
TUSTIN_MCAS	OU 0000001B SOUTH	TW22S	Temporary well point	6082601.688	2203498.64	TW22S-20200709	Ground water	9-Jul-20	Perfluoroalkyl Compounds	2001444