eurofins | Environment Testing America

ANALYTICAL REPORT

Eurofins Canton
180 S. Van Buren Avenue
Barberton, OH 44203
Tel: (330)497-9396

Laboratory Job ID: 240-167926-1
Client Project/Site: City of Richmond WWTP

For:
City of Richmond
36725 Division Rd
PO BOX 457
Richmond, Michigan 48062

Attn: Jim Goetzinger

Authorized for release by:
6/18/2022 7:28:50 PM

Kris Brooks, Project Manager II
(330)966-9790
Kris.Brooks@et.eurofinsus.com

Table of Contents

Definitions/Glossary

Client: City of Richmond
Project/Site: City of Richmond WWTP

Job ID: 240-167926-1

Qualifiers

LCMS

Qualifier	Qualifier Description
*5-	Isotope dilution analyte is outside acceptance limits, low biased.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Job ID: 240-167926-1

Laboratory: Eurofins Canton

Narrative

Job Narrative
240-167926-1

Comments
The SOP WS-OC-0025 Perfluorinated Hydrocarbons analysis was performed at the Eurofins Sacramento laboratory.

Receipt
The sample was received on 6/9/2022 9:30 AM. Unless otherwise noted below, the sample arrived in good condition, and where required, properly preserved and on ice. The temperature of the cooler at receipt was 3.5º C.

LCMS
Method 537 (modified): Isotope Dilution Analyte (IDA) recovery is above the method recommended limit for the following samples: (180-139268-H-8-A) and (180-139268-H-8-B MS). Quantitation by isotope dilution generally precludes any adverse effect on data quality due to elevated IDA recoveries.

Method 537 (modified): The Isotope Dilution Analyte (IDA) recovery associated with the following sample is below the method recommended limit: SLUDGE TANKS-RICHMOND WWTP (240-167926-1). Generally, data quality is not considered affected if the IDA signal-to-noise ratio is greater than 10:1, which is achieved for all IDA in the sample(s).

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

General Chemistry
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Organic Prep
Method SHAKE: The following samples in preparation batch 320-594924 were yellow in color following extraction: SLUDGE TANKS-RICHMOND WWTP (240-167926-1)

Method SHAKE: Due to the matrix, the initial volumes used for the following samples deviated from the standard procedure: SLUDGE TANKS-RICHMOND WWTP (240-167926-1). The reporting limits (RLs) have been adjusted proportionately.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Method Summary

Client: City of Richmond
Project/Site: City of Richmond WWTP

Job ID: 240-167926-1

Method	Method Description	Protocol	Laboratory
537 (modified)	Fluorinated Alkyl Substances	EPA	TAL SAC
D 2216	Percent Moisture	ASTM	TAL SAC
SHAKE	Shake Extraction with Ultrasonic Bath Extraction	SW846	TAL SAC

Protocol References:

ASTM = ASTM International

EPA = US Environmental Protection Agency

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL SAC = Eurofins Sacramento, 880 Riverside Parkway, West Sacramento, CA 95605, TEL (916)373-5600

Sample Summary

Client: City of Richmond
Project/Site: City of Richmond WWTP

Job ID: 240-167926-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
240-167926-1	SLUDGE TANKS-RICHMOND WWTP	Solid	06/02/22 12:18	06/09/22 09:30

Detection Summary

Client: City of Richmond
Project/Site: City of Richmond WWTP

Job ID: 240-167926-1

Client Sample ID: SLUDGE TANKS-RICHMOND WWTP — Lab Sample ID: 240-167926-1

Analyte	Result	Qualifier	RL		Unit	Dil Fac	D	Method	Prep Type
Perfluoropentanoic acid (PFPeA)	4.1		4.0		ug/Kg	1	☼	537 (modified)	Total/NA
Perfluorohexanoic acid (PFHxA)	10		4.0		ug/Kg	1	☼	537 (modified)	Total/NA
Perfluorooctanoic acid (PFOA)	18		4.0		ug/Kg	1	☼	537 (modified)	Total/NA
Perfluorononanoic acid (PFNA)	4.1		4.0		ug/Kg	1	☼	537 (modified)	Total/NA
Perfluorodecanoic acid (PFDA)	91		4.0		ug/Kg	1	☼	537 (modified)	Total/NA
Perfluoroundecanoic acid (PFUnA)	5.9		4.0		ug/Kg	1	☼	537 (modified)	Total/NA
Perfluorododecanoic acid (PFDoA)	24		4.0		ug/Kg	1	☼	537 (modified)	Total/NA
Perfluorotetradecanoic acid (PFTeA)	6.0		4.0		ug/Kg	1	☼	537 (modified)	Total/NA
Perfluorooctanesulfonic acid (PFOS)	20		4.0		ug/Kg	1	☼	537 (modified)	Total/NA
Perfluorooctanesulfonamide (FOSA)	6.2		4.0		ug/Kg	1	☼	537 (modified)	Total/NA
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	25		4.0		ug/Kg	1	☼	537 (modified)	Total/NA
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	8.0		4.0		ug/Kg	1	☼	537 (modified)	Total/NA

This Detection Summary does not include radiochemical test results.

Client: City of Richmond
Project/Site: City of Richmond WWTP

Job ID: 240-167926-1

Client Sample ID: SLUDGE TANKS-RICHMOND WWTP

Date Collected: 06/02/22 12:18
Date Received: 06/09/22 09:30

Lab Sample ID: 240-167926-1

Matrix: Solid
Percent Solids: 4.7

Method: 537 (modified) - Fluorinated Alkyl Substances

Analyte	Result	Qualifier	RL		Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	<4.0		4.0		ug/Kg	☼	06/12/22 19:57	06/13/22 23:01	1
Perfluoropentanoic acid (PFPeA)	**4.1**		4.0		ug/Kg	☼	06/12/22 19:57	06/13/22 23:01	1
Perfluorohexanoic acid (PFHxA)	**10**		4.0		ug/Kg	☼	06/12/22 19:57	06/13/22 23:01	1
Perfluoroheptanoic acid (PFHpA)	<4.0		4.0		ug/Kg	☼	06/12/22 19:57	06/13/22 23:01	1
Perfluorooctanoic acid (PFOA)	**18**		4.0		ug/Kg	☼	06/12/22 19:57	06/13/22 23:01	1
Perfluorononanoic acid (PFNA)	**4.1**		4.0		ug/Kg	☼	06/12/22 19:57	06/13/22 23:01	1
Perfluorodecanoic acid (PFDA)	**91**		4.0		ug/Kg	☼	06/12/22 19:57	06/13/22 23:01	1
Perfluoroundecanoic acid (PFUnA)	**5.9**		4.0		ug/Kg	☼	06/12/22 19:57	06/13/22 23:01	1
Perfluorododecanoic acid (PFDoA)	**24**		4.0		ug/Kg	☼	06/12/22 19:57	06/13/22 23:01	1
Perfluorotridecanoic acid (PFTriA)	<4.0		4.0		ug/Kg	☼	06/12/22 19:57	06/13/22 23:01	1
Perfluorotetradecanoic acid (PFTeA)	**6.0**		4.0		ug/Kg	☼	06/12/22 19:57	06/13/22 23:01	1
Perfluorobutanesulfonic acid (PFBS)	<4.0		4.0		ug/Kg	☼	06/12/22 19:57	06/13/22 23:01	1
Perfluoropentanesulfonic acid (PFPeS)	<4.0		4.0		ug/Kg	☼	06/12/22 19:57	06/13/22 23:01	1
Perfluorohexanesulfonic acid (PFHxS)	<4.0		4.0		ug/Kg	☼	06/12/22 19:57	06/13/22 23:01	1
Perfluoroheptanesulfonic acid (PFHpS)	<4.0		4.0		ug/Kg	☼	06/12/22 19:57	06/13/22 23:01	1
Perfluorooctanesulfonic acid (PFOS)	**20**		4.0		ug/Kg	☼	06/12/22 19:57	06/13/22 23:01	1
Perfluorononanesulfonic acid (PFNS)	<4.0		4.0		ug/Kg	☼	06/12/22 19:57	06/13/22 23:01	1
Perfluorodecanesulfonic acid (PFDS)	<4.0		4.0		ug/Kg	☼	06/12/22 19:57	06/13/22 23:01	1
Perfluorooctanesulfonamide (FOSA)	**6.2**		4.0		ug/Kg	☼	06/12/22 19:57	06/13/22 23:01	1
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	**25**		4.0		ug/Kg	☼	06/12/22 19:57	06/13/22 23:01	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	**8.0**		4.0		ug/Kg	☼	06/12/22 19:57	06/13/22 23:01	1
4:2 FTS	<4.0		4.0		ug/Kg	☼	06/12/22 19:57	06/13/22 23:01	1
6:2 FTS	<4.0		4.0		ug/Kg	☼	06/12/22 19:57	06/13/22 23:01	1
8:2 FTS	<4.0		4.0		ug/Kg	☼	06/12/22 19:57	06/13/22 23:01	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	<4.0		4.0		ug/Kg	☼	06/12/22 19:57	06/13/22 23:01	1
HFPO-DA (GenX)	<4.0		4.0		ug/Kg	☼	06/12/22 19:57	06/13/22 23:01	1
F-53B Major	<4.0		4.0		ug/Kg	☼	06/12/22 19:57	06/13/22 23:01	1
F-53B Minor	<4.0		4.0		ug/Kg	☼	06/12/22 19:57	06/13/22 23:01	1

Isotope Dilution	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*19*	*5-*	*25 - 150*	*06/12/22 19:57*	*06/13/22 23:01*	*1*
13C5 PFPeA	*89*		*25 - 150*	*06/12/22 19:57*	*06/13/22 23:01*	*1*
13C2 PFHxA	*91*		*25 - 150*	*06/12/22 19:57*	*06/13/22 23:01*	*1*
13C4 PFHpA	*107*		*25 - 150*	*06/12/22 19:57*	*06/13/22 23:01*	*1*
13C4 PFOA	*102*		*25 - 150*	*06/12/22 19:57*	*06/13/22 23:01*	*1*
13C5 PFNA	*106*		*25 - 150*	*06/12/22 19:57*	*06/13/22 23:01*	*1*
13C2 PFDA	*88*		*25 - 150*	*06/12/22 19:57*	*06/13/22 23:01*	*1*
13C2 PFUnA	*104*		*25 - 150*	*06/12/22 19:57*	*06/13/22 23:01*	*1*
13C2 PFDoA	*101*		*25 - 150*	*06/12/22 19:57*	*06/13/22 23:01*	*1*
13C2 PFTeDA	*89*		*25 - 150*	*06/12/22 19:57*	*06/13/22 23:01*	*1*
18O2 PFHxS	*100*		*25 - 150*	*06/12/22 19:57*	*06/13/22 23:01*	*1*
13C4 PFOS	*99*		*25 - 150*	*06/12/22 19:57*	*06/13/22 23:01*	*1*
13C8 FOSA	*102*		*25 - 150*	*06/12/22 19:57*	*06/13/22 23:01*	*1*

Client: City of Richmond
Project/Site: City of Richmond WWTP

Job ID: 240-167926-1

Client Sample ID: SLUDGE TANKS-RICHMOND WWTP
Date Collected: 06/02/22 12:18
Date Received: 06/09/22 09:30

Lab Sample ID: 240-167926-1
Matrix: Solid
Percent Solids: 4.7

Method: 537 (modified) - Fluorinated Alkyl Substances (Continued)

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 PFBS	94		25 - 150	06/12/22 19:57	06/13/22 23:01	1
d3-NMeFOSAA	104		25 - 150	06/12/22 19:57	06/13/22 23:01	1
d5-NEtFOSAA	100		25 - 150	06/12/22 19:57	06/13/22 23:01	1
M2-6:2 FTS	139		25 - 150	06/12/22 19:57	06/13/22 23:01	1
M2-8:2 FTS	131		25 - 150	06/12/22 19:57	06/13/22 23:01	1
M2-4:2 FTS	125		25 - 150	06/12/22 19:57	06/13/22 23:01	1
13C3 HFPO-DA	102		25 - 150	06/12/22 19:57	06/13/22 23:01	1

General Chemistry

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture	95.3		0.1	%			06/14/22 11:53	1
Percent Solids	4.7		0.1	%			06/14/22 11:53	1

Method: 537 (modified) - Fluorinated Alkyl Substances

Lab Sample ID: MB 320-594924/1-A
Matrix: Solid
Analysis Batch: 595982

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 594924

Analyte	MB Result	MB Qualifier	RL		Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanoic acid (PFBA)	<0.20		0.20		ug/Kg		06/12/22 19:57	06/13/22 19:39	1
Perfluoropentanoic acid (PFPeA)	<0.20		0.20		ug/Kg		06/12/22 19:57	06/13/22 19:39	1
Perfluorohexanoic acid (PFHxA)	<0.20		0.20		ug/Kg		06/12/22 19:57	06/13/22 19:39	1
Perfluoroheptanoic acid (PFHpA)	<0.20		0.20		ug/Kg		06/12/22 19:57	06/13/22 19:39	1
Perfluorooctanoic acid (PFOA)	<0.20		0.20		ug/Kg		06/12/22 19:57	06/13/22 19:39	1
Perfluorononanoic acid (PFNA)	<0.20		0.20		ug/Kg		06/12/22 19:57	06/13/22 19:39	1
Perfluorodecanoic acid (PFDA)	<0.20		0.20		ug/Kg		06/12/22 19:57	06/13/22 19:39	1
Perfluoroundecanoic acid (PFUnA)	<0.20		0.20		ug/Kg		06/12/22 19:57	06/13/22 19:39	1
Perfluorododecanoic acid (PFDoA)	<0.20		0.20		ug/Kg		06/12/22 19:57	06/13/22 19:39	1
Perfluorotridecanoic acid (PFTriA)	<0.20		0.20		ug/Kg		06/12/22 19:57	06/13/22 19:39	1
Perfluorotetradecanoic acid (PFTeA)	<0.20		0.20		ug/Kg		06/12/22 19:57	06/13/22 19:39	1
Perfluorobutanesulfonic acid (PFBS)	<0.20		0.20		ug/Kg		06/12/22 19:57	06/13/22 19:39	1
Perfluoropentanesulfonic acid (PFPeS)	<0.20		0.20		ug/Kg		06/12/22 19:57	06/13/22 19:39	1
Perfluorohexanesulfonic acid (PFHxS)	<0.20		0.20		ug/Kg		06/12/22 19:57	06/13/22 19:39	1
Perfluoroheptanesulfonic acid (PFHpS)	<0.20		0.20		ug/Kg		06/12/22 19:57	06/13/22 19:39	1
Perfluorooctanesulfonic acid (PFOS)	<0.20		0.20		ug/Kg		06/12/22 19:57	06/13/22 19:39	1
Perfluorononanesulfonic acid (PFNS)	<0.20		0.20		ug/Kg		06/12/22 19:57	06/13/22 19:39	1
Perfluorodecanesulfonic acid (PFDS)	<0.20		0.20		ug/Kg		06/12/22 19:57	06/13/22 19:39	1
Perfluorooctanesulfonamide (FOSA)	<0.20		0.20		ug/Kg		06/12/22 19:57	06/13/22 19:39	1
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	<0.20		0.20		ug/Kg		06/12/22 19:57	06/13/22 19:39	1
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	<0.20		0.20		ug/Kg		06/12/22 19:57	06/13/22 19:39	1
4:2 FTS	<0.20		0.20		ug/Kg		06/12/22 19:57	06/13/22 19:39	1
6:2 FTS	<0.20		0.20		ug/Kg		06/12/22 19:57	06/13/22 19:39	1
8:2 FTS	<0.20		0.20		ug/Kg		06/12/22 19:57	06/13/22 19:39	1
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	<0.20		0.20		ug/Kg		06/12/22 19:57	06/13/22 19:39	1
HFPO-DA (GenX)	<0.20		0.20		ug/Kg		06/12/22 19:57	06/13/22 19:39	1
F-53B Major	<0.20		0.20		ug/Kg		06/12/22 19:57	06/13/22 19:39	1
F-53B Minor	<0.20		0.20		ug/Kg		06/12/22 19:57	06/13/22 19:39	1

Isotope Dilution	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C4 PFBA	*50*		*25 - 150*	*06/12/22 19:57*	*06/13/22 19:39*	*1*
13C5 PFPeA	*91*		*25 - 150*	*06/12/22 19:57*	*06/13/22 19:39*	*1*
13C2 PFHxA	*90*		*25 - 150*	*06/12/22 19:57*	*06/13/22 19:39*	*1*
13C4 PFHpA	*89*		*25 - 150*	*06/12/22 19:57*	*06/13/22 19:39*	*1*
13C4 PFOA	*93*		*25 - 150*	*06/12/22 19:57*	*06/13/22 19:39*	*1*
13C5 PFNA	*95*		*25 - 150*	*06/12/22 19:57*	*06/13/22 19:39*	*1*
13C2 PFDA	*93*		*25 - 150*	*06/12/22 19:57*	*06/13/22 19:39*	*1*
13C2 PFUnA	*89*		*25 - 150*	*06/12/22 19:57*	*06/13/22 19:39*	*1*
13C2 PFDoA	*96*		*25 - 150*	*06/12/22 19:57*	*06/13/22 19:39*	*1*
13C2 PFTeDA	*89*		*25 - 150*	*06/12/22 19:57*	*06/13/22 19:39*	*1*
18O2 PFHxS	*91*		*25 - 150*	*06/12/22 19:57*	*06/13/22 19:39*	*1*
13C4 PFOS	*91*		*25 - 150*	*06/12/22 19:57*	*06/13/22 19:39*	*1*
13C8 FOSA	*96*		*25 - 150*	*06/12/22 19:57*	*06/13/22 19:39*	*1*
13C3 PFBS	*90*		*25 - 150*	*06/12/22 19:57*	*06/13/22 19:39*	*1*
d3-NMeFOSAA	*99*		*25 - 150*	*06/12/22 19:57*	*06/13/22 19:39*	*1*

Method: 537 (modified) - Fluorinated Alkyl Substances (Continued)

Lab Sample ID: MB 320-594924/1-A
Matrix: Solid
Analysis Batch: 595982

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 594924

Isotope Dilution	MB %Recovery	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
d5-NEtFOSAA	98		25 - 150	06/12/22 19:57	06/13/22 19:39	1
M2-6:2 FTS	100		25 - 150	06/12/22 19:57	06/13/22 19:39	1
M2-8:2 FTS	89		25 - 150	06/12/22 19:57	06/13/22 19:39	1
M2-4:2 FTS	90		25 - 150	06/12/22 19:57	06/13/22 19:39	1
13C3 HFPO-DA	96		25 - 150	06/12/22 19:57	06/13/22 19:39	1

Lab Sample ID: LCS 320-594924/2-A
Matrix: Solid
Analysis Batch: 595982

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 594924

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Perfluorobutanoic acid (PFBA)	2.00	1.98		ug/Kg		99	76 - 136
Perfluoropentanoic acid (PFPeA)	2.00	1.93		ug/Kg		96	69 - 129
Perfluorohexanoic acid (PFHxA)	2.00	2.00		ug/Kg		100	71 - 131
Perfluoroheptanoic acid (PFHpA)	2.00	2.01		ug/Kg		101	71 - 131
Perfluorooctanoic acid (PFOA)	2.00	1.99		ug/Kg		100	72 - 132
Perfluorononanoic acid (PFNA)	2.00	2.02		ug/Kg		101	73 - 133
Perfluorodecanoic acid (PFDA)	2.00	2.13		ug/Kg		106	72 - 132
Perfluoroundecanoic acid (PFUnA)	2.00	2.01		ug/Kg		101	66 - 126
Perfluorododecanoic acid (PFDoA)	2.00	2.05		ug/Kg		102	71 - 131
Perfluorotridecanoic acid (PFTriA)	2.00	1.98		ug/Kg		99	71 - 131
Perfluorotetradecanoic acid (PFTeA)	2.00	2.11		ug/Kg		106	67 - 127
Perfluorobutanesulfonic acid (PFBS)	1.77	1.91		ug/Kg		108	69 - 129
Perfluoropentanesulfonic acid (PFPeS)	1.88	1.95		ug/Kg		104	66 - 126
Perfluorohexanesulfonic acid (PFHxS)	1.82	1.81		ug/Kg		99	62 - 122
Perfluoroheptanesulfonic acid (PFHpS)	1.90	1.89		ug/Kg		99	76 - 136
Perfluorooctanesulfonic acid (PFOS)	1.86	1.88		ug/Kg		101	68 - 141
Perfluorononanesulfonic acid (PFNS)	1.92	1.88		ug/Kg		98	72 - 132
Perfluorodecanesulfonic acid (PFDS)	1.93	1.98		ug/Kg		103	71 - 131
Perfluorooctanesulfonamide (FOSA)	2.00	2.04		ug/Kg		102	77 - 137
N-methylperfluorooctanesulfonamidoacetic acid (NMeFOSAA)	2.00	1.90		ug/Kg		95	72 - 132
N-ethylperfluorooctanesulfonamidoacetic acid (NEtFOSAA)	2.00	2.00		ug/Kg		100	72 - 132
4:2 FTS	1.87	1.67		ug/Kg		89	68 - 143
6:2 FTS	1.90	1.95		ug/Kg		103	73 - 139
8:2 FTS	1.92	2.02		ug/Kg		105	75 - 135
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	1.88	1.87		ug/Kg		99	79 - 139
HFPO-DA (GenX)	2.00	2.04		ug/Kg		102	53 - 158
F-53B Major	1.86	1.85		ug/Kg		99	74 - 134

Method: 537 (modified) - Fluorinated Alkyl Substances (Continued)

Lab Sample ID: LCS 320-594924/2-A
Matrix: Solid
Analysis Batch: 595982

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 594924

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits		
F-53B Minor			1.88	1.93		ug/Kg		102	66 - 136		

Isotope Dilution	*LCS %Recovery*	*LCS Qualifier*	*Limits*
13C4 PFBA	*40*		*25 - 150*
13C5 PFPeA	*91*		*25 - 150*
13C2 PFHxA	*92*		*25 - 150*
13C4 PFHpA	*101*		*25 - 150*
13C4 PFOA	*100*		*25 - 150*
13C5 PFNA	*104*		*25 - 150*
13C2 PFDA	*99*		*25 - 150*
13C2 PFUnA	*102*		*25 - 150*
13C2 PFDoA	*104*		*25 - 150*
13C2 PFTeDA	*96*		*25 - 150*
18O2 PFHxS	*101*		*25 - 150*
13C4 PFOS	*101*		*25 - 150*
13C8 FOSA	*101*		*25 - 150*
13C3 PFBS	*93*		*25 - 150*
d3-NMeFOSAA	*103*		*25 - 150*
d5-NEtFOSAA	*108*		*25 - 150*
M2-6:2 FTS	*104*		*25 - 150*
M2-8:2 FTS	*104*		*25 - 150*
M2-4:2 FTS	*106*		*25 - 150*
13C3 HFPO-DA	*101*		*25 - 150*

QC Association Summary

Client: City of Richmond
Project/Site: City of Richmond WWTP

Job ID: 240-167926-1

LCMS

Prep Batch: 594924

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-167926-1	SLUDGE TANKS-RICHMOND WWTP	Total/NA	Solid	SHAKE	
MB 320-594924/1-A	Method Blank	Total/NA	Solid	SHAKE	
LCS 320-594924/2-A	Lab Control Sample	Total/NA	Solid	SHAKE	

Analysis Batch: 595982

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-167926-1	SLUDGE TANKS-RICHMOND WWTP	Total/NA	Solid	537 (modified)	594924
MB 320-594924/1-A	Method Blank	Total/NA	Solid	537 (modified)	594924
LCS 320-594924/2-A	Lab Control Sample	Total/NA	Solid	537 (modified)	594924

General Chemistry

Analysis Batch: 595342

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-167926-1	SLUDGE TANKS-RICHMOND WWTP	Total/NA	Solid	D 2216	

Lab Chronicle

Client: City of Richmond
Project/Site: City of Richmond WWTP

Job ID: 240-167926-1

Client Sample ID: SLUDGE TANKS-RICHMOND WWTP
Lab Sample ID: 240-167926-1
Date Collected: 06/02/22 12:18
Matrix: Solid
Date Received: 06/09/22 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	D 2216		1	595342	06/14/22 11:53	KMW	TAL SAC

Client Sample ID: SLUDGE TANKS-RICHMOND WWTP
Lab Sample ID: 240-167926-1
Date Collected: 06/02/22 12:18
Matrix: Solid
Date Received: 06/09/22 09:30
Percent Solids: 4.7

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	SHAKE			594924	06/12/22 19:57	AM	TAL SAC
Total/NA	Analysis	537 (modified)		1	595982	06/13/22 23:01	K1S	TAL SAC

Laboratory References:

TAL SAC = Eurofins Sacramento, 880 Riverside Parkway, West Sacramento, CA 95605, TEL (916)373-5600

Accreditation/Certification Summary

Client: City of Richmond
Project/Site: City of Richmond WWTP

Job ID: 240-167926-1

Laboratory: Eurofins Sacramento

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Alaska (UST)	State	17-020	02-20-24
ANAB	Dept. of Defense ELAP	L2468	01-20-24
ANAB	Dept. of Energy	L2468.01	01-20-24
ANAB	ISO/IEC 17025	L2468	01-20-24
Arizona	State	AZ0708	08-11-22
Arkansas DEQ	State	88-0691	06-17-22
California	State	2897	01-31-23
Colorado	State	CA0004	08-31-22
Florida	NELAP	E87570	06-30-22
Georgia	State	4040	01-30-23
Hawaii	State	<cert No.>	01-29-23
Illinois	NELAP	200060	03-17-24
Kansas	NELAP	E-10375	10-31-22
Louisiana	NELAP	01944	06-30-22
Louisiana (All)	NELAP	01944	06-30-22
Maine	State	CA00004	04-14-24
Michigan	State	9947	01-31-23
Nevada	State	CA00044	08-31-22
New Hampshire	NELAP	2997	04-18-23
New Jersey	NELAP	CA005	06-30-22
New York	NELAP	11666	04-01-23
Ohio	State	41252	01-29-23
Oregon	NELAP	4040	01-29-23
Texas	NELAP	T104704399-19-13	05-31-22 *
US Fish & Wildlife	US Federal Programs	58448	07-31-22
USDA	US Federal Programs	P330-18-00239	01-23-23
Utah	NELAP	CA000442021-12	02-28-23
Virginia	NELAP	460278	03-14-23
Washington	State	C581	05-05-23
West Virginia (DW)	State	9930C	12-31-22
Wisconsin	State	998204680	08-31-22
Wyoming	State Program	8TMS-L	01-28-19 *

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

Eurofins Canton
180 S. Van Buren Avenue
Barberton, OH 44203
Phone: 330-497-9396 Fax: 330-497-0772

3.5/3.5

Chain of Custody Record

eurofins | Environment Testing America

Client Information	Sampler: Brent R. Ames	Lab PM: Brooks, Kris M	Carrier Tracking No(s):	COC No: 240-94550-32027.1
Client Contact: Beth Eldridge	Phone: (586)246-1179	E-Mail: Kris.Brooks@et.eurofinsus.com	State of Origin: MI	Page: Page 1 of 1
Company: Tetra Tech [redacted]	PWSID:			Job #
Address: 710 Avis Drive	Due Date Requested:			
City: Ann Arbor	TAT Requested (days):			
State, Zip: MI, 48108	Compliance Project: ∧ Yes ∧ No			
Phone:	PO #: Purchase Order not required			
Email: beth.eldridge@tetratech.com	WO #: 200-12751-24001.099			
Project Name: City of Richmond WWTP	Project #: 24027171			
Site: City of Richmond WWTP	SSOW#:			

Analysis Requested

Preservation Codes:

A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - other (specify)

Other:

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	PFC_IDA - PFAS, Standard List (28 Analytes)	Moisture - Local Method	Total Number of containers	Special Instructions/Note:
			Preservation Code:				N	N		
Sludge Tanks - Richmond WWTP	6/2/22	12:18P	G	Solid			2			
Sludge Tanks - Richmond WWTP	6/2/22	12:18P	G	Solid				1		

240-167926 Chain of Custody

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements:

Empty Kit Relinquished by: | Date: | Time: | Method of Shipment:

Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Beth Eldridge	6/8/22 1000am	TT	[signature]	6-9-22 930	ETA

Custody Seals Intact: ∧ Yes ∧ No | Custody Seal No.: | Cooler Temperature(s) °C and Other Remarks:

Ver: 06/08/2021

Eurofins - Canton Sample Receipt Form/Narrative **Login # :** 167926
Barberton Facility

Client Tetra tech Site Name _____ Cooler unpacked by: Justin H

Cooler Received on 6-9-22 Opened on 6-9-22

FedEx: 1st Grd Exp UPS FAS Clipper Client Drop Off Eurofins Courier Other _____

Receipt After-hours: Drop-off Date/Time _____ Storage Location _____

Eurofins Cooler # TA Foam Box Client Cooler Box Other _____

Packing material used: Bubble Wrap Foam Plastic Bag None Other _____

COOLANT: Wet Ice Blue Ice Dry Ice Water None

1. Cooler temperature upon receipt ☐ See Multiple Cooler Form
   IR GUN# IR-13 (CF **0.0** °C) Observed Cooler Temp. 3.5 °C Corrected Cooler Temp. 3.5 °C
   IR GUN #IR-15 (CF **-0.7**°C) Observed Cooler Temp. _____ °C Corrected Cooler Temp. _____ °C

2. Were tamper/custody seals on the outside of the cooler(s)? If Yes Quantity 1	Yes	No
-Were the seals on the outside of the cooler(s) signed & dated?	Yes	No NA
-Were tamper/custody seals on the bottle(s) or bottle kits (LLHg/MeHg)?	Yes	No
-Were tamper/custody seals intact and uncompromised?	Yes	No NA
3. Shippers' packing slip attached to the cooler(s)?	Yes	No
4. Did custody papers accompany the sample(s)?	Yes	No
5. Were the custody papers relinquished & signed in the appropriate place?	Yes	No
6. Was/were the person(s) who collected the samples clearly identified on the COC?	Yes	No
7. Did all bottles arrive in good condition (Unbroken)?	Yes	No
8. Could all bottle labels (ID/Date/Time) be reconciled with the COC?	Yes	No
9. For each sample, does the COC specify preservatives (Y/N), # of containers (Y/N), and sample type of grab/comp(Y/N)?		
10. Were correct bottle(s) used for the test(s) indicated?	Yes	No
11. Sufficient quantity received to perform indicated analyses?	Yes	No
12. Are these work share samples and all listed on the COC?	Yes	No
If yes, Questions 13-17 have been checked at the originating laboratory.		
13. Were all preserved sample(s) at the correct pH upon receipt?	Yes	No NA pH Strip Lot# **HC178690**
14. Were VOAs on the COC?	Yes	No
15. Were air bubbles >6 mm in any VOA vials? ● ⬅ Larger than this.	Yes	No NA
16. Was a VOA trip blank present in the cooler(s)? Trip Blank Lot # _____	Yes	No
17. Was a LL Hg or Me Hg trip blank present? _____	Yes	No

Tests that are not checked for pH by Receiving:
VOAs
Oil and Grease
TOC

Contacted PM _____ Date _____ by _____ via Verbal Voice Mail Other

Concerning _____

18. CHAIN OF CUSTODY & SAMPLE DISCREPANCIES ☐ additional next page

Samples processed by:

_____

_____

_____

_____

19. SAMPLE CONDITION

Sample(s) _____ were received after the recommended holding time had expired.
Sample(s) _____ were received in a broken container.
Sample(s) _____ were received with bubble >6 mm in diameter. (Notify PM)

20. SAMPLE PRESERVATION

Sample(s) _____ were further preserved in the laboratory.
Time preserved: _____ Preservative(s) added/Lot number(s): _____

VOA Sample Preservation - Date/Time VOAs Frozen: _____

WI-NC-099

Eurofins Canton
180 S. Van Buren Avenue
Barberton, OH 44203
Phone: 330-497-9396 Fax: 330-497-0772

Chain of Custody Record

eurofins | Environment Testing America

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Brooks, Kris M	Carrier Tracking No(s):	COC No: 240-153257.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: Kris.Brooks@et.eurofinsus.com	State of Origin: Michigan	Page: Page 1 of 1
Company: Eurofins Environment Testing Northern Ca		Accreditations Required (See note):		Job #: 240-167926-1
Address: 880 Riverside Parkway, ,	Due Date Requested: 6/22/2022			
City: West Sacramento	TAT Requested (days):			
State, Zip: CA, 95605				
Phone: 916-373-5600(Tel) 916-372-1059(Fax)	PO #:			
Email:	WO #:			
Project Name: City of Richmond WWTP	Project #: 24027171			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:

A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Y - Trizma, Z - other (specify)

Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	PFC_IDA/Shake_Bath_14D (MOD) PFAS, Standard List (28 Analytes)	Moisture/ Percent Moisture	Total Number of containers	Special Instructions/Note:
			Preservation Code:							
SLUDGE TANKS-RICHMOND WWTP (240-167926-1)	6/2/22	12:18 Eastern		Solid			X	X	3	

Note: Since laboratory accreditations are subject to change, Eurofins Environment Testing North Central, LLC places the ownership of method, analyte & accreditation compliance upon out subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the Eurofins Environment Testing North Central, LLC laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins Environment Testing North Central, LLC attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said complicance to Eurofins Environment Testing North Central, LLC.

Possible Hazard Identification	***Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)***
Unconfirmed	☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* _____ *Months*
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
[signature]	6-9-22 1454	ETA	[signature]	6/10/22 910	EETSAC
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks:

Login Sample Receipt Checklist

Client: City of Richmond

Job Number: 240-167926-1

Login Number: 167926
List Number: 2
Creator: Guzman, Juan

List Source: Eurofins Sacramento
List Creation: 06/10/22 03:09 PM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	0.8
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	False	Received project as a subcontract.
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

eurofins | Environment Testing TestAmerica

Sacramento
Sample Receiving Notes

240-167926 Field Sheet

Job: _____

Tracking # : 557057038587

SO / FO / FO / SAT / 2-Day / Ground / UPS / CDO / Courier

GSO / OnTrac / Goldstreak / USPS / Other _____

Use this form to record Sample Custody Seal, Cooler Custody Seal, Temperature & corrected Temperature & other observations.
File in the job folder with the COC.

Therm. ID: L-10 Corr. Factor: (+ / -) N/A °C

Ice ✓ Wet ✓ Gel _____ Other _____

Cooler Custody Seal: –

Cooler ID: –

Temp Observed: 0.8 °C Corrected: 0.8 °C

From: Temp Blank ☐ Sample ☑

Opening/Processing The Shipment	Yes	No	NA
Cooler compromised/tampered with?	☐	☑	☐
Cooler Temperature is acceptable?	☑	☐	☐
Frozen samples show signs of thaw?	☐	☐	☑

Initials: LM Date: 6/10/22

Unpacking/Labeling The Samples	Yes	No	NA
COC is complete w/o discrepancies?	☑	☐	☐
Samples compromised/tampered with?	☐	☑	☐
Containers are not broken or leaking?	☑	☐	☐
Sample custody seal?	☐	☑	☐
Sample containers have legible labels?	☑	☐	☐
Sample date/times are provided?	☑	☐	☐
Appropriate containers are used?	☑	☐	☐
Sample bottles are completely filled?	☑	☐	☐
Sample preservatives verified?	☐	☐	☑
Is the Field Sampler's name on COC?	☐	☐	☑
Samples require splitting/compositing?	☐	☐	☑
Samples w/o discrepancies?	☑	☐	☐
Zero headspace?*	☐	☐	☑
Alkalinity has no headspace?	☐	☐	☑
Perchlorate has headspace? (Methods 314, 331, 6850)	☐	☐	☑
Multiphasic samples are not present?	☑	☐	☐

*Containers requiring zero headspace have no headspace, or bubble < 6 mm (1/4")

Initials: JG Date: 6/10/22

Notes: _____

Trizma Lot #(s): _____

Login Completion	Yes	No	NA
Receipt Temperature on COC?	☑	☐	☐
Samples received within hold time?	☑	☐	☐
NCM Filed?	☐	☑	☐
Log Release checked in TALS?	☐	☐	☑

Initials: JG Date: 6/10/22

Isotope Dilution Summary

Client: City of Richmond
Project/Site: City of Richmond WWTP

Job ID: 240-167926-1

Method: 537 (modified) - Fluorinated Alkyl Substances

Matrix: Solid

Prep Type: Total/NA

		Percent Isotope Dilution Recovery (Acceptance Limits)							
		PFBA	PFPeA	PFHxA	C4PFHA	PFOA	PFNA	PFDA	PFUnA
Lab Sample ID	Client Sample ID	(25-150)	(25-150)	(25-150)	(25-150)	(25-150)	(25-150)	(25-150)	(25-150)
240-167926-1	SLUDGE TANKS-RICHMOND V	19 *5-	89	91	107	102	106	88	104
LCS 320-594924/2-A	Lab Control Sample	40	91	92	101	100	104	99	102
MB 320-594924/1-A	Method Blank	50	91	90	89	93	95	93	89

		Percent Isotope Dilution Recovery (Acceptance Limits)							
		PFDoA	PFTDA	PFHxS	PFOS	PFOSA	C3PFBS	d3NMFOS	d5NEFOS
Lab Sample ID	Client Sample ID	(25-150)	(25-150)	(25-150)	(25-150)	(25-150)	(25-150)	(25-150)	(25-150)
240-167926-1	SLUDGE TANKS-RICHMOND V	101	89	100	99	102	94	104	100
LCS 320-594924/2-A	Lab Control Sample	104	96	101	101	101	93	103	108
MB 320-594924/1-A	Method Blank	96	89	91	91	96	90	99	98

		Percent Isotope Dilution Recovery (Acceptance Limits)			
		M262FTS	M282FTS	M242FTS	HFPODA
Lab Sample ID	Client Sample ID	(25-150)	(25-150)	(25-150)	(25-150)
240-167926-1	SLUDGE TANKS-RICHMOND V	139	131	125	102
LCS 320-594924/2-A	Lab Control Sample	104	104	106	101
MB 320-594924/1-A	Method Blank	100	89	90	96

Surrogate Legend

PFBA = 13C4 PFBA
PFPeA = 13C5 PFPeA
PFHxA = 13C2 PFHxA
C4PFHA = 13C4 PFHpA
PFOA = 13C4 PFOA
PFNA = 13C5 PFNA
PFDA = 13C2 PFDA
PFUnA = 13C2 PFUnA
PFDoA = 13C2 PFDoA
PFTDA = 13C2 PFTeDA
PFHxS = 18O2 PFHxS
PFOS = 13C4 PFOS
PFOSA = 13C8 FOSA
C3PFBS = 13C3 PFBS
d3NMFOS = d3-NMeFOSAA
d5NEFOS = d5-NEtFOSAA
M262FTS = M2-6:2 FTS
M282FTS = M2-8:2 FTS
M242FTS = M2-4:2 FTS
HFPODA = 13C3 HFPO-DA