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AR226-1950

285758

Analytical Report

3M Company

Analysis of PFOA and PFOS in Water Samples from Oakdale Municipality

E05-0184

Exygen Report No. L0004708

Testing Laboratory

Exygen Research
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State College, PA 16801

Requester

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EHS Operations
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1 *Introduction*

Results are reported for the analysis of perfluorooctanoate (PFOA) and perfluorooctanesulfonate (PFOS) in water samples received at Exygen as requested by Gary Hohenstein of 3M Company. The Exygen project number assigned to the samples is L0004706. Table I lists the target analytes quantitated for the samples.

Table I. Target Analytes for Quantitation

Parameter	Acronym	Formula
Perfluorooctanoate	PFOA or C8 acid	$C_7F_{15}COO^-$
Perfluorooctanesulfonate	PFOS or C8 sulfonate	$C_8F_{17}SO_3^-$

2 *Sample Receipt*

Thirty-one samples were received at Exygen in 500 mL white plastic narrow-mouth bottles. At the request of 3M, all samples were analyzed. A copy of all sample log-in information is presented in Attachment A.

The samples were received on 03/01/05. The samples were shipped ambient via UPS. The samples were stored refrigerated from time of receipt until analysis.

3 *Methods - Analytical and Preparatory*

The Exygen method entitled, "Method of Analysis for the Determination of Perfluorooctane sulfonate (PFOS), Perfluorooctane sulfonylamide (PFOSA), and Perfluorooctanoate (POAA) in Water," modified for isomer separation, was used to prepare and analyze the samples. A summary of the sample preparation can be found in Section 3.1 and the modified analysis conditions for isomer separation can be found in Section 3.2.

3.1 Water Sample Preparation

Solid phase extraction (SPE) was used to prepare the water samples for LC/MS/MS analysis. Forty milliliters of the water sample was transferred to a C_{18} SPE cartridge. The cartridge was washed with 5 mL of a 40% methanol: 60% water wash. The cartridge was eluted with 5 mL of 100% methanol. A portion of the extract was transferred to autosampler vials and analyzed using electrospray LC/MS/MS.

3.2 Sample Analysis by LC/MS/MS

In High Pressure Liquid Chromatography (HPLC), an aliquot of extract is injected and passed through a liquid-phase chromatographic column. Based on the affinity of the analyte for the stationary phase in the column relative to the liquid mobile phase, the analyte is retained for a characteristic amount of time. Following HPLC separation, mass spectrometry provides a rapid and accurate means for analyzing a wide range of organic compounds. Molecules are ionized, fragmented, and detected. The ions characteristic of the compounds are observed and quantitated against extracted standards.

An HP1100 system interfaced to an Applied Biosystems API 4000 was used to analyze the sample extracts for quantitation.

Isomer separation was obtained using a gradient elution through a Thermo Fluophase RP, 50 x 2.1 mm x 5µm column. The sum of the isomers is reported as a single value for each of the analytes.

The following gradient was performed:

Mobile Phase (A): 2mM Ammonium Acetate in Water
Mobile Phase (B): Methanol

Time	%A	%B
0.0	65	35
1.0	65	35
8.0	25	75
10.0	25	75
11.0	65	35
18.0	65	35

The following parameters were used for operation of the mass spectrometer:

Parameter	Setting
Ionization Mode	Electrospray
Polarity	Negative
Transitions Monitored	413->369 (PFOA), 499->80 (PFOS), 415->370 (^{13}C-PFOA, surrogate spike)
Gas Temperature	350°C
Drying Gas (N2)	7.0 L/min

4 Analysis

4.1 Calibration

A 7-point calibration curve was analyzed initially and throughout the analytical sequence for PFOA, PFOS and ^{13}C PFOA. The calibration points were prepared at 0, 25, 50, 100, 250, 500, and 1000 ng/L (ppt) for LC/MS/MS analysis. Calibration standards are prepared using the same SPE procedure used for samples. The instrument response versus the concentration was plotted for each point. Using linear regression with 1/x weighting, the slope, y-intercept

and coefficient of determination (r^2) were determined. A calibration curve is acceptable if $r^2 \geq 0.985$.

For the results reported here, calibration criteria were met. The calibration curves are included in the raw data in Attachment C.

4.2 Surrogates

^{13}C PFOA ($C_8F_{15}[^{13}C]F_2[^{13}C]OOH$) is used as a surrogate for the water samples. ^{13}C PFOA was added to the empty sample containers before the bottles were sent to the field for sampling. In the field, all sample and quality control bottles were filled to a volumetric fill line with the sample.

^{13}C PFOA recoveries can be found in Attachment B.

4.3 Laboratory Control Spikes

Laboratory control spikes in the analytical set were prepared by adding a known concentration of PFOA, ^{13}C PFOA, and PFOS to laboratory reagents. Laboratory control spikes are used to assess method accuracy. The laboratory control spikes must show recoveries between 70-130% or the data is rejected. For the results reported here, the laboratory control spikes were within the acceptable range.

4.4 Field Matrix Spikes

A low and a high matrix spike were prepared for every water sample in the field. Compounds were added to the empty sample containers before the bottles were sent to the field for sampling. Matrix spikes are used to assess method accuracy in the matrix. The matrix spikes should show recoveries between 70-130%. For the results reported here, the matrix spikes were within the acceptable range, except as noted in Section 6 of this report.

4.5 Sample Related Comments

All water samples were collected in duplicate. Duplicate sample results are reported along with the sample results in Attachment B.

5 *Data Summary*

Please see Attachment B for a detailed listing of the analytical results. The results are reported in parts per billion (ng/mL) for PFOA and PFOS.

6 *Statement of Accuracy*

Based on results of laboratory control spikes, field matrix spikes, and surrogate spikes, the analytical accuracy for PFOS and PFOA results for all samples is ± 30%. Laboratory control spikes, surrogate spikes and field matrix spikes showed recoveries within these ranges, with the following exceptions:

- The PFOA and PFOS recovery in O-W6-572606 Low Spike, O-Public Works Lunch Rm Sink Low Spike, and O-W5-127287 Low Spike could not be calculated because the inherent sample concentration in this sample was over 3 times greater than the spiking concentration.

- The PFOS recovery for sample O-Public Works Lunch Rm Sink High Spike was 135%.

Specific sample recoveries are given in Attachment B.

7 Data/Sample Retention

Samples will be returned to 3M 60 days after final reporting. All electronic data is archived on retrievable media and hard copy reports are stored in data folders maintained by Exygen. Hardcopy data is stored for a minimum of five years. The client will be notified 30 days prior to the disposal of hardcopy data.

8 Attachments

7.1 Attachment A: Analytical Results

7.2 Attachment B: Spike Recovery Data

7.3 Attachment C: Chain of Custody Forms

7.4 Attachment D: Raw Analytical Data

9 Signatures

Karen Risha, Principal Investigator — Date: 03/14/05

John M. Flaherty, Vice President — Date: 3/14/05

SECTION A

Exygen RESEARCH
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Analytical Report

Summary of PFOA and PFOS in Water Samples E05-0184

Exygen ID	Sample ID	Analyte Found (ng/mL) C8 Acid PFOA Perfluorooctanoate	C8 Sulfonate PFOS Perfluorooctanesulfonate
L4708-1	O-W5-127287	0.714	0.889
L4708-2	O-W5-127287 Dup	0.781	0.968
L4708-5	O-W1-208462	0.0892	0.0516
L4708-6	O-W1-208462 Dup	0.0852	0.0541
L4708-9	O-W2-208463	0.0807	NQ
L4708-10	O-W2-208463 Dup	0.0871	NQ
L4708-13	O-W7-463534	0.274	0.238
L4708-14	O-W7-463534 Dup	0.305	0.273
L4708-17	O-W8-572608	0.523	0.687
L4708-18	O-W8-572608 Dup	0.503	0.662
L4708-21	O-W3-208454	ND	ND
L4708-22	O-W3-208454 Dup	ND	ND
L4708-25	O-Public Works Lunch Rm Sink	0.687	0.872
L4708-26	O-Public Works Lunch Rm Sink Dup	0.709	0.949
L4708-29	Trip Blank E05-0184	ND	ND

ND = Not detected at or above 0.025 ng/mL.
NQ = Not quantifiable = Measured concentration between 0.025 ng/mL and the Limit of Quantitation (LOQ) which is 0.050 ng/mL.

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SECTION B

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Field Matrix Spike Recovery Summary for PFOA and PFOS in Water E05-0184

Sample Description	C8 Acid PFOA Amount Spiked (ng/mL)	C8 Acid PFOA Amt Found In Sample (ng/mL)	C8 Acid PFOA Amount Recovered (ng/mL)	C8 Acid PFOA Recovery (%)	C8 Sulfonate PFOS Amt Found In Sample (ng/mL)	C8 Sulfonate PFOS Amount Recovered (ng/mL)	C8 Sulfonate PFOS Recovery (%)
O-W5-127287 Low Spike (L4780-3, 0.1 ppb Spike)	0.1	0.714	0.889	*	0.869	1.16	*
O-W5-127287 High Spike (L4780-4, 1 ppb Spike)	1	0.714	1.67	96	0.869	1.80	91
O-W1-208462 Low Spike (L4780-7, 0.1 ppb Spike)	0.1	0.0892	0.188	99	0.0516	0.153	101
O-W1-208462 High Spike (L4780-8, 1 ppb Spike)	1	0.0892	1.08	99	0.0516	1.10	105
O-W2-208463 Low Spike (L4708-11, 0.1 ppb Spike)	0.1	0.0807	0.195	114	0.0296	0.159	129
O-W2-208463 High Spike (L4708-12, 1 ppb Spike)	1	0.0807	1.16	108	0.0296	1.23	120
O-W7-463534 Low Spike (L4708-15, 0.1 ppb Spike)	0.1	0.274	0.383	109	0.238	0.366	128
O-W7-463534 High Spike (L4708-16, 1 ppb Spike)	1	0.274	1.29	102	0.238	1.27	103
O-W8-572608 Low Spike (L4708-19, 0.1 ppb Spike)	0.1	0.523	0.620	*	0.887	0.801	*
O-W8-572608 High Spike (L4708-20, 1 ppb Spike)	1	0.523	1.64	112	0.887	1.90	121
O-W3-208454 Low Spike (L4708-23, 0.1 ppb Spike)	0.1	ND	0.107	107	ND	0.114	114
O-W3-208454 High Spike (L4708-24, 1 ppb Spike)	1	ND	1.12	112	ND	1.20	120
O-Public Works Lunch Rm Sink Low Spike (L4708-27, 0.1 ppb Spike)	0.1	0.687	0.798	*	0.872	0.961	*
O-Public Works Lunch Rm Sink High Spike (L4708-28, 1 ppb Spike)	1	0.687	1.95	126	0.872	2.22	135
Trip Blank E05-0184 Low Spk (L4708-30, 0.1 ppb Spike)	0.1	ND	0.123	123	ND	0.119	119
Trip Blank E05-0184 High Spk (L4708-31, 1 ppb Spike)	1	ND	0.940	94	ND	1.03	103

*Sample residue exceeds the spiking level significantly: therefore, an accurate recovery value cannot be calculated
ND = Not detected at or above 0.025 ng/mL.
NQ = Not quantifiable = Measured concentration between 0.025 ng/mL and the Limit of Quantitation (LOQ) which is 0.050 ng/mL.

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Surrogate Spike Recovery Summary for ^{13}C-PFOA in Water E05-0184

		^{13}C-PFOA		
Exygen ID	Sample Description	Amount Spiked (ng/mL)	Amount Recovered (ng/mL)	Recovery (%)
L4708-1	O-W5-127287	0.5	0.487	97
L4708-2	O-W5-127287 Dup	0.5	0.520	104
L4708-3	O-W5-127287 Low Spk	0.5	0.546	109
L4708-4	O-W5-127287 High Spk	0.5	0.465	93
L4708-5	O-W1-208462	0.5	0.545	109
L4708-6	O-W1-208462 Dup	0.5	0.497	99
L4708-7	O-W1-208462 Low Spk	0.5	0.517	103
L4708-8	O-W1-208462 High Spk	0.5	0.508	102
L4708-9	O-W2-208463	0.5	0.536	107
L4708-10	O-W2-208463 Dup	0.5	0.603	121
L4708-11	O-W2-208463 Low Spk	0.5	0.583	117
L4708-12	O-W2-208463 High Spk	0.5	0.552	110
L4708-13	O-W7-463534	0.5	0.540	108
L4708-14	O-W7-463534 Dup	0.5	0.608	122
L4708-15	O-W7-463534 Low Spk	0.5	0.571	114
L4708-16	O-W7-463534 High Spk	0.5	0.529	106
L4708-17	O-W8-572608	0.5	0.586	117
L4708-18	O-W8-572608 Dup	0.5	0.529	106
L4708-19	O-W8-572608 Low Spk	0.5	0.617	123
L4708-20	O-W8-572608 High Spk	0.5	0.551	110
L4708-21	O-W3-208454	0.5	0.596	119
L4708-22	O-W3-208454 Dup	0.5	0.581	116
L4708-23	O-W3-208454 Low Spk	0.5	0.537	107
L4708-24	O-W3-208454 High Spk	0.5	0.635	127
L4708-25	O-Public Works Lunch Rm Sink	0.5	0.487	97
L4708-26	O-Public Works Lunch Rm Sink Dup	0.5	0.488	98
L4708-27	O-Public Works Lunch Rm Sink Low Spk	0.5	0.483	97
L4708-28	O-Public Works Lunch Rm Sink High Spk	0.5	0.575	115
L4708-29	Trip Blank E05-0184	0.5	0.524	105
L4708-30	Trip Blank E05-0184 Low Spk	0.5	0.522	104
L4708-31	Trip Blank E05-0184 High Spk	0.5	0.504	101

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SECTION C

Exygen RESEARCH
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Login

Login Group: L0004708

Login #: 4818
Project: P0001275
Company Name: 3M
Submitted By: KENT LINDSTROM
Login Type: Immediate Receipt of Samples
Started: True
Date Start: 03/01/2005
Due Date: 03/11/2005
Received Date: 03/01/2005
Received By: Ammerman, Mark
Spread Sample:
Label:
Exygen SD/PI: Risha, Karen
Project Title/Type: Cottage Grove Residential Water Sampling / ROUTINE
Login Notes:
Conform Notes:

Conform COC Sample: True
Conform COC: True
Conform Sample: True
Conform Request: True

Packages / Containers

Package	Carton	Date / Condition	Shipper / ID	Temp. Control/Temp.	Direction / Handled By
PK0005558		Login Date: 3/1/2005 11:11:51AM Package & Contents Uncompromised	UPS 1Z57955E0142913994	None 22.3	RECEIVED Ammerman, Mark

Container #	Gross Weight	pH	Container Type	Preservative	Mfg. Lot	Mfg. ID
C0063056	260.50 g		500 ml Clear Plastic Narrow	NONE		
C0063057	267.30 g		500 ml Clear Plastic Narrow	NONE		
C0063058	256.90 g		500 ml Clear Plastic Narrow	NONE		
C0063059	257.70 g		500 ml Clear Plastic Narrow	NONE		
C0063060	256.80 g		500 ml Clear Plastic Narrow	NONE		
C0063061	266.80 g		500 ml Clear Plastic Narrow	NONE		
C0063062	252.90 g		500 ml Clear Plastic Narrow	NONE		
C0063063	259.90 g		500 ml Clear Plastic Narrow	NONE		
C0063064	254.10 g		500 ml Clear Plastic Narrow	NONE		
C0063065	245.90 g		500 ml Clear Plastic Narrow	NONE		
C0063066	248.40 g		500 ml Clear Plastic Narrow	NONE		
C0063067	240.90 g		500 ml Clear Plastic Narrow	NONE		
C0063068	249.30 g		500 ml Clear Plastic Narrow	NONE		
C0063069	251.10 g		500 ml Clear Plastic Narrow	NONE		

Login

Login Group: L0004708

Login #:	4818	Conform COC Sample:	True
Project:	P0001275	Conform COC:	True
Company Name:	3M	Conform Sample:	True
Submitted By:	KENT LINDSTROM	Conform Request:	True
Login Type:	Immediate Receipt of Samples		
Started:	True		
Date Start:	03/01/2005		
Due Date:	03/11/2005		
Received Date:	03/01/2005		
Received By:	Ammerman, Mark		
Spread Sample:			
Label:			
Exygen SD/PI:	Risha, Karen		
Project Title/Type:	Cottage Grove Residential Water Sampling / ROUTINE		
Login Notes:			
Conform Notes:			

Packages / Containers

Package	Carton	Date / Condition	Shipper / ID	Temp. Control/Temp.	Direction / Handled By
PK0005558		Login Date: 3/1/2005 11:11:51AM Package & Contents Uncompromised	UPS 1Z57955E0142913994	None 22.3	RECEIVED Ammerman, Mark

Container #	Gross Weight	pH	Container Type	Preservative	Mfg. Lot	Mfg. ID
C0063070	248.00 g		500 ml Clear Plastic Narrow	NONE		
C0063071	252.60 g		500 ml Clear Plastic Narrow	NONE		
C0063072	246.10 g		500 ml Clear Plastic Narrow	NONE		
C0063073	259.20 g		500 ml Clear Plastic Narrow	NONE		
C0063074	266.10 g		500 ml Clear Plastic Narrow	NONE		
C0063075	251.80 g		500 ml Clear Plastic Narrow	NONE		
C0063076	261.30 g		500 ml Clear Plastic Narrow	NONE		
C0063077	249.20 g		500 ml Clear Plastic Narrow	NONE		
C0063078	253.00 g		500 ml Clear Plastic Narrow	NONE		
C0063079	248.90 g		500 ml Clear Plastic Narrow	NONE		
C0063080	265.30 g		500 ml Clear Plastic Narrow	NONE		
C0063081	259.40 g		500 ml Clear Plastic Narrow	NONE		
C0063082	256.90 g		500 ml Clear Plastic Narrow	NONE		

Package	Carton	Date / Condition	Shipper / ID	Temp. Control/Temp.	Direction / Handled By
PK0005559		Login Date: 3/1/2005 11:16:07AM Package & Contents Uncompromised	UPS 1Z57955E0140875806	None 22.3	RECEIVED Ammerman, Mark

Container #	Gross Weight	pH	Container Type	Preservative	Mfg. Lot	Mfg. ID
C0063083	264.40 g		500 ml Clear Plastic Narrow	NONE		
C0063084	262.80 g		500 ml Clear Plastic Narrow	NONE		

0010

Login

Login Group: L0004708

Login #:	4818	Conform COC Sample:	True
Project:	P0001275	Conform COC:	True
Company Name:	3M	Conform Sample:	True
Submitted By:	KENT LINDSTROM	Conform Request:	True
Login Type:	Immediate Receipt of Samples		
Started:	True		
Date Start:	03/01/2005		
Due Date:	03/11/2005		
Received Date:	03/01/2005		
Received By:	Ammerman, Mark		
Spread Sample:			
Label:			
Exygen SD/PI:	Risha, Karen		
Project Title/Type:	Cottage Grove Residential Water Sampling / ROUTINE		
Login Notes:			
Conform Notes:			

Packages / Containers

Package	Carton	Date / Condition	Shipper / ID	Temp. Control/Temp.	Direction / Handled By
PK0005559		Login Date: 3/1/2005 11:16:07AM Package & Contents Uncompromised	UPS 1Z57955E0140675806	None 22.3	RECEIVED Ammerman, Mark

Container #	Gross Weight	pH	Container Type	Preservative	Mfg. Lot	Mfg. ID
C0063085	264.10 g		500 ml Clear Plastic Narrow	NONE		
C0063086	253.90 g		500 ml Clear Plastic Narrow	NONE		

Login

Samples

Sample ID	Container	Matrix	Fraction	Sample	Date Sampled	Date Logged In	Date Due
L0004708-0001	C0063056	LIQUID	Water	O-W5-127287	02/28/2005	03/01/2005	03/11/2005
L0004708-0002	C0063057	LIQUID	Water	O-W5-Dup (127287)	02/28/2005	03/01/2005	03/11/2005
L0004708-0003	C0063058	LIQUID	Water	O-W5-127287-Low Spike	02/28/2005	03/01/2005	03/11/2005
L0004708-0004	C0063059	LIQUID	Water	O-W5-127287-High Spike	02/28/2005	03/01/2005	03/11/2005
L0004708-0005	C0063060	LIQUID	Water	O-W1-208462	02/28/2005	03/01/2005	03/11/2005
L0004708-0006	C0063061	LIQUID	Water	O-W1-208462-Dup	02/28/2005	03/01/2005	03/11/2005
L0004708-0007	C0063062	LIQUID	Water	O-W1-208462-Low Spike	02/28/2005	03/01/2005	03/11/2005
L0004708-0008	C0063063	LIQUID	Water	O-W1-208462-High Spike	02/28/2005	03/01/2005	03/11/2005
L0004708-0009	C0063064	LIQUID	Water	O-W2-208463	02/28/2005	03/01/2005	03/11/2005
L0004708-0010	C0063065	LIQUID	Water	O-W2-208463-Dup	02/28/2005	03/01/2005	03/11/2005
L0004708-0011	C0063066	LIQUID	Water	O-W2-208463-Low Spike	02/28/2005	03/01/2005	03/11/2005
L0004708-0012	C0063067	LIQUID	Water	O-W2-208463-High Spike	02/28/2005	03/01/2005	03/11/2005
L0004708-0013	C0063068	LIQUID	Water	O-W7-463534	02/28/2005	03/01/2005	03/11/2005
L0004708-0014	C0063069	LIQUID	Water	O-W7-463534-Dup	02/28/2005	03/01/2005	03/11/2005
L0004708-0015	C0063070	LIQUID	Water	O-W7-463534-Low Spike	02/28/2005	03/01/2005	03/11/2005
L0004708-0016	C0063071	LIQUID	Water	O-W7-463534-High Spike	02/28/2005	03/01/2005	03/11/2005
L0004708-0017	C0063072	LIQUID	Water	O-W8-572608	02/28/2005	03/01/2005	03/11/2005
L0004708-0018	C0063073	LIQUID	Water	O-W8-572608-Dup	02/28/2005	03/01/2005	03/11/2005
L0004708-0019	C0063074	LIQUID	Water	O-W8-572608-Low Spike	02/28/2005	03/01/2005	03/11/2005
L0004708-0020	C0063075	LIQUID	Water	O-W8-572608-High Spike	02/28/2005	03/01/2005	03/11/2005
L0004708-0021	C0063076	LIQUID	Water	O-W3-208454	02/28/2005	03/01/2005	03/11/2005
L0004708-0022	C0063077	LIQUID	Water	O-W3-208454-Dup	02/28/2005	03/01/2005	03/11/2005
L0004708-0023		LIQUID	Water	O-W3-208454-Low Spike	02/28/2005	03/01/2005	03/11/2005

0012

Login

	C0063078						
L0004708-0024	C0063079	LIQUID	Water	O-W3-208454-High Spike	02/28/2005	03/01/2005	03/11/2005
L0004708-0025	C0063083	LIQUID	Water	O-Public Works Lunch Rm Sink	02/28/2005	03/01/2005	03/11/2005
L0004708-0026	C0063084	LIQUID	Water	O-Public Works Lunch Rm Sink Dup	02/28/2005	03/01/2005	03/11/2005
L0004708-0027	C0063085	LIQUID	Water	O-Public Works Lunch Rm Sink Low Spike	02/28/2005	03/01/2005	03/11/2005
L0004708-0028	C0063086	LIQUID	Water	O-Public Works Lunch Rm Sink High Spike	02/28/2005	03/01/2005	03/11/2005
L0004708-0029	C0063080	LIQUID	Water	Trip Blank E05-0184		03/01/2005	03/11/2005
L0004708-0030	C0063081	LIQUID	Water	Trip Blank E05-0184 Low Spike		03/01/2005	03/11/2005
L0004708-0031	C0063082	LIQUID	Water	Trip Blank E05-0184 High Spike		03/01/2005	03/11/2005

Login Reviewed By: EC Date/Time: 3-1-05 1145

0013

3M Environmental Laboratory

Form 36778 - PWO

Shipping Address: 3M Bldg. 2-3E-09, 935 Bush Avenue, St. Paul, MN 55106
Telephone: Sample Receiving: (651) 778-4648; Alternate: (651) 778-5763; FAX: (651) 778-5176

Chain of Custody /Request for Laboratory Analytical

08517

Project ID/Project Name	Oakdale Municipal Well EC's III
Template #	
Project Lead	Kent Lindstrom
Dept. # (main)	530711
Final Report Due Date	
Internal Due Date	
Class/Job/Project #	00226744449

3M Env. Lab Project # For Internal Use Only: EOS-0184

Report Results To

Contact Name: Gary Hohenstein
Company: 3M
Mailing Address:
City, State, Zip:
Telephone #: FAX #:

Date Available: 3/1
Date Due: 3/15
Contract Lab: Exygen

Special Instructions and/or Specific Regulatory Requirements: (method, limit of detection, reporting units, etc.)

Preservatives: HNO3 | H2SO4 | VOCs | None | Other

Total Number of Containers

Analysis Requested: Complete below. Attach any associated information.
See attached LR EOS-0184

(Enter an 'X' in the box below to indicate request)

Item #	Client Sample Identification	3M LIMS#	Date Sampled	Time Sampled	Matrix/ Media	Enter the number of containers of each	Total Number of Containers
1.	O-WS-127287	79855	2/28/05	0835	W	1	1
2.	O-WS-DUP(127287)	79856	2/28/05	0839		1	1
3.	O-WS-127287-Low Spike	QC		0835		1	1
4.	O-WS-127287-High Spike	QC		0835		1	1
5.	O-WI-208462	79849		0846		1	1
6.	O-WI-208462 Dup	79850		0846		1	1
7.	O-WI-208462 Low Spike	QC		0846		1	1
8.	O-WI-208462 High Spike	QC		0846		1	1
9.	O-W2-208463	79851		0900		1	1
10.	O-W2-208463 Dup	79852		0901		1	1

Collected by (print): Brad Jacobson
Collector's signature: Brad Jacobson

Chain of Custody

Item #	Relinquished by/Affiliation	Time	Date	Shipped Via:	Received by/Affiliation	Time	Date
1-10	Brad Jacobson/Pace	1252	2/28/05	Self	Paul Smith/3M	1320	2/28/05
*1-10	Paul Smith/3M	1530	2/28/05	UPS NR			
					Pace	1010	03/01/05

Sample Condition Upon Receipt: O Acceptable O Other:
Temperature: °C O Received on Ice
Other Associated CoCs: 08545, 08546, 08548
Copies to: KL

Comments: * TO OXYGEN

Original - Accompanying Samples; Last Page - Originator

See Reverse Side for Instructions

3M Environmental Laboratory

Form 38776 - PWO

Shipping Address: 3M Bldg. 2-3E-09, 935 Bush Avenue, St. Paul, MN 55106
Telephone: Sample Receiving: (651) 778-4648, Alternate: (651) 778-4783, FAX: (651) 778-6176

Chain of Custody /Request for Laboratory Analytical

08545

3M Env. Lab Project # For Internal Use Only: E05-0184

Project ID/Project Name: Oakdale Municipal Well PCS III
Template #:
Project Lead: Kent Lindstrom
Dept. # (main): 530711
Final Report Due Date:
Internal Due Date:
Class/Job/Project #: 00226744d9

Report Results to:
Contact Name: Gary Hohenstein
Company: 3M
Mailing Address:
City, State, Zip:
Telephone #: FAX #:

Date Available:
Date Due:
Contract Lab: Exygen

Special Instructions and/or Specific Regulatory Requirements: (method, limit of detection, reporting units, etc.)

Preservatives: HNO3 | H2SO4 | VOCs | None | Other
Total Number of Containers

Analysis Requested: Complete below. Attach any associated information.
See Attached LR
E05-0184

Item #	Client Sample Identification	3M LIMS#	Date Sampled	Time Sampled	Matrix/ Media	None	Total Containers
1.	O-W2-208463 LowSpike	QC	2/28/05	0900	W	1	1
2.	O-W2-208463 HighSpike	QC	2/28/05	0900		1	1
3.	O-W7-463534	77857	2/28/05	0916		1	1
4.	O-W7-463534 Dup	77858	2/28/05	0916		1	1
5.	O-W7-463534 LowSpike	QC	2/28/05	0916		1	1
6.	O-W7-463534 HighSpike	QC	2/28/05	0916		1	1
7.	O-W8-572608	77857	2/28/05	0932		1	1
8.	O-W8-572608 Dup	77860	2/28/05	0932		1	1
9.	O-W8-572608 LowSpike	QC	2/28/05	0932		1	1
10.	O-W8-572608 HighSpike	QC	2/28/05	0932		1	1

Enter the number of containers of each

(Enter an 'X' in the box below to indicate request)

Chain of Custody

Collected by (print): Brad Jacobson
Collector's signature:

Item #	Relinquished by/Affiliation	Time	Date	Shipped Via:	Received by/Affiliation	Time	Date
1-10	Brad Jacobson/Pace	1252	2/28/05	Self	Pat Smith/3M	1320	2/28/05
* 1-10	Pat Smith/3M	1530	2/28/05	UPS ne			
					Exygen	10 m	3/1/05

Sample Condition Upon Receipt: ☑ Acceptable ○ Other:
Temperature: °C ○ Received on Ice
Other Associated CoCs: 08517, 08546, 08548
Copies to: KRL

Comments: * TO EXYGEN

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3M Environmental Laboratory

Form 38778 - PWO

Shipping Address: 3M Bldg 2-3E-09, 935 Bush Avenue, St. Paul, MN 55106
Telephone: Sample Receiving: (651) 778-4348; Alternate: (651) 778-6753; FAX: (651) 778-6178

Chain of Custody /Request for Laboratory Analytical 08546

Project ID/Project Name	Oakdale Munic #2 Well EC's III
Template #	
Project Lead	Kent Lindstrom
Dept. # (main)	530711
Final Report Due Date	
Internal Due Date	
Class/Job/Project #	CB22674499

3M Env. Lab Project # For Internal Use Only: E05-0184

Report Results to:

Contact Name	Gary Hohenstein
Company	3M
Mailing Address	
City, State, Zip	
Telephone #	FAX #

Date Available	3/1
Date Due	3/13
Contract Lab	Exygen

Special Instructions and/or Specific Regulatory Requirements: (method, limit of detection, reporting units, etc.)

Preservatives: HNO3 | H2SO4 | VOCs | None | Other

Total Number of Containers

Analysis Requested: Complete below. Attach any associated information.

See attached LR E05-0184

(Enter an 'X' in the box below to indicate request)

Item #	Client Sample Identification	3M LIMS#	Date Sampled	Time Sampled	Matrix/ Media	Enter the number of containers of each	Total Number of Containers
1.	O-W3-208454	79853	2/28/05	0948	W	1	1
2.	O-W3-208454 DUP	79854		0948		1	1
3.	O-W3-208454 Low Spike	QC		0948		1	1
4.	O-W3-208454 High Spike	QC		0948		1	1
5.	O-Public Works Lunch Room Sink	79855		1003		1	1
6.	O-Public Works Lunch Room Sink Dup	79856		1003		1	1
7.	O-Public Works Lunch Room Sink Low Spike	QC		1003		1	1
8.	O-Public Works Lunch Room Sink High Spike	QC		1003		1	1
9.	Trip Blank E05-0184	79857	Exygen		W	1	1
10.	Trip Blank E05-0184 Low Spike	QC	Exygen		W	1	1

Collected by (print): Brad Jacobson

Collector's signature: Brad Jacobson

Chain of Custody

Item #	Relinquished by/Affiliation	Time	Date	Shipped Via:	Received by/Affiliation	Time	Date
1-8, 10	Brad Jacobson / Pace	1252	3/28/05	Self	Phil Fenwick / 3M	1320	2/29/05
* 1-10	Phil Fenwick / 3M	1536	2/28/05	UPS NL			
					Exygen	1010	03/01/05

Sample Condition Upon Receipt: ☒ Acceptable ☐ Other:

Temperature: °C ☐ Received on Ice

Other Associated CoCs: 08517, 08545, 08548

Copies to: KRL

Comments: * TO EXYGEN

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3M Environmental Laboratory

Form 36778 - PWO

Shipping Address:
3M Bldg. 2-3E-09
935 Bush Avenue
St. Paul, MN 55106

Telephone:
Sample Receiving: (651) 778-4848
Alternate: (651) 778-4783
FAX: (651) 778-6176

Chain of Custody /Request for Laboratory Analytical

08548

Project ID/Project Name	Oakdale Municipal Well EC5 III
Template #	
Project Lead	Kent Landstrom
Dept. # (main)	530711
Final Report Due Date	
Internal Due Date	
Class/Job/Project #	00226744

3M Env. Lab Project # For Internal Use Only: E05-0184

Report Results to:

Contact Name	Gary Hohenstein
Company	3M
Mailing Address	
City, State, Zip	
Telephone #	FAX #

Date Available	3/1
Date Due	3/9
Contract Lab	Exygen

Special Instructions and/or Specific Regulatory Requirements: (method, limit of detection, reporting units, etc.)

* Trip Blanks Filled by Exygen & Transported w/ Bottle order. BCJ 2/28/05

Preservatives: HNO3 | H2SO4 | VOCs | None | Other

Total Number of Containers

Analysis Requested: Complete below. Attach any associated information.

Enter the number of containers of each (Enter an 'X' in the box below to indicate request)

Item #	Client Sample Identification	3M LIMS#	Date Sampled	Time Sampled	Matrix/ Media	None	Total Number of Containers	PFOA	PFOS
* 1.	Trip Blank E05-0184 High Spike	QC	Exygen		W	L	1	X	X
2.									
3.									
4.									
5.									
6.									
7.									
8.									
9.									
10.									

Chain of Custody

Collected by (print): Exygen (BCJ - Pace)

Collector's signature:

Item #	Relinquished by/Affiliation	Time	Date	Shipped Via:	Received by/Affiliation	Time	Date
1	Brad Hayton / Pace	1252	2/28/05	self	Pat Fennett / 3M	1320	2/28/05
* 1	Pat Fennett / 3M	1530	2/28/05	UPS AM			
					Exygen	1010	03/01/05

Sample Condition Upon Receipt: ☑ Acceptable ○ Other:

Temperature: °C ○ Received on Ice

Other Associated CoCs: 08517, 08545, 08546

Copies to: KRL

Comments: * TO EXYGEN

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3M ENVIRONMENTAL LABORATORY
CONTRACT LABORATORY WORK ORDER BY SAMPLE

Project: E05-0184

Contract Lab(s): EXYGEN

Requester: Hohenstein, Gary A (0042-02E-27)
Department: 530711
Project Number: 0022674449
Date Received: 2/25/2005
Project Description: Oakdale Municipal Well FC's III

Completion Date:
Project Lead: Kent Lindstrom
Phone Number: 651-778-5352
Email Address: krlindstrom@mmm.com

Ship Date: 2/28/05

Comments:

Pace field samling.

Trip blanks filled by Exygen & transported w/bottle order. BGJ, 2/28/05.

Trip blanks for E05-0184 also used for E05-0186 per direction from Kent Lindstrom. Samples traveled together. AC, PLF, 2/28/05.

3M Sample Number	Sampled Date	Sample Description	
E05-0184-79849	2/28/2005	O-W1-208462	
Analysis Code	**Analytical Method**	**Components**	**Analysis Due Date**
PFOA	PFOA	PFOA	3/15/2005
PFOS	PFOS by ESMS	PFOS	3/15/2005
E05-0184-79850	2/28/2005	O-W1-208462 Dup	
Analysis Code	**Analytical Method**	**Components**	**Analysis Due Date**
PFOA	PFOA	PFOA	3/15/2005
PFOS	PFOS by ESMS	PFOS	3/15/2005
E05-0184-79851	2/28/2005	O-W2-208463	
Analysis Code	**Analytical Method**	**Components**	**Analysis Due Date**
PFOA	PFOA	PFOA	3/15/2005
PFOS	PFOS by ESMS	PFOS	3/15/2005
E05-0184-79852	2/28/2005	O-W2-208463 Dup	
Analysis Code	**Analytical Method**	**Components**	**Analysis Due Date**
PFOA	PFOA	PFOA	3/15/2005
PFOS	PFOS by ESMS	PFOS	3/15/2005
E05-0184-79853	2/28/2005	O-W3-208454	
Analysis Code	**Analytical Method**	**Components**	**Analysis Due Date**
PFOA	PFOA	PFOA	3/15/2005
PFOS	PFOS by ESMS	PFOS	3/15/2005
E05-0184-79854	2/28/2005	O-W3-208454 Dup	

0018

3M ENVIRONMENTAL LABORATORY
CONTRACT LABORATORY WORK ORDER BY SAMPLE

Project: E05-0184 (cont.) Contract Lab(s): EXYGEN

3M Sample Number	Sampled Date	Sample Description	
E05-0184-79854 (cont.)	2/28/2005	O-W3-208454 Dup	
Analysis Code	Analytical Method	Components	Analysis Due Date
PFOA	PFOA	PFOA	3/15/2005
PFOS	PFOS by ESMS	PFOS	3/15/2005
E05-0184-79855	2/28/2005	O-W5-127287	
Analysis Code	Analytical Method	Components	Analysis Due Date
PFOA	PFOA	PFOA	3/15/2005
PFOS	PFOS by ESMS	PFOS	3/15/2005
E05-0184-79856	2/28/2005	O-W5-127287 Dup	
Analysis Code	Analytical Method	Components	Analysis Due Date
PFOA	PFOA	PFOA	3/15/2005
PFOS	PFOS by ESMS	PFOS	3/15/2005
E05-0184-79857	2/28/2005	O-W7-463534	
Analysis Code	Analytical Method	Components	Analysis Due Date
PFOA	PFOA	PFOA	3/15/2005
PFOS	PFOS by ESMS	PFOS	3/15/2005
E05-0184-79858	2/28/2005	O-W7-463534 Dup	
Analysis Code	Analytical Method	Components	Analysis Due Date
PFOA	PFOA	PFOA	3/15/2005
PFOS	PFOS by ESMS	PFOS	3/15/2005
E05-0184-79859	2/28/2005	O-W8-572608	
Analysis Code	Analytical Method	Components	Analysis Due Date
PFOA	PFOA	PFOA	3/15/2005
PFOS	PFOS by ESMS	PFOS	3/15/2005
E05-0184-79860	2/28/2005	O-W8-572608 Dup	
Analysis Code	Analytical Method	Components	Analysis Due Date
PFOA	PFOA	PFOA	3/15/2005
PFOS	PFOS by ESMS	PFOS	3/15/2005
E05-0184-79865	2/28/2005	Public Works Bldg	
Analysis Code	Analytical Method	Components	Analysis Due Date
PFOA	PFOA	PFOA	3/15/2005
PFOS	PFOS by ESMS	PFOS	3/15/2005
E05-0184-79866	2/28/2005	Public Works Bldg Dup	
Analysis Code	Analytical Method	Components	Analysis Due Date
PFOA	PFOA	PFOA	3/15/2005
PFOS	PFOS by ESMS	PFOS	3/15/2005

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3M ENVIRONMENTAL LABORATORY
CONTRACT LABORATORY WORK ORDER BY SAMPLE

Project: E05-0184 (cont.) Contract Lab(s): EXYGEN

3M Sample Number	Sampled Date	Sample Description
E05-0184-79867	2/28/2005	Trip Blank

Analysis Code	Analytical Method	Components	Analysis Due Date
PFOA	PFOA	PFOA	3/15/2005
PFOS	PFOS by ESMS	PFOS	3/15/2005