

BIODEGRADATION (BOD/COD)

TEST SUBSTANCE

Identity: A mixture containing perfluorooctanesulfonate, which may also be referred to as PFOS, FC-95, or as a component of FC-203C and L-5440. (1-Octanesulfonic acid, 1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-, potassium salt, CAS # 2795-39-3)

Remarks: The 3M production lot number was 501. The test sample is FC-203C. Current information indicates FC-203C is a mixture of 1.47% PFOS, 60% water, 30% diethylene glycol butyl ether, 3% sodium octyl sulfate, 3% hydroxy foamer, 10% polyoxyethylene monooctylphenyl ether, 0.12% sodium lauryl sulfate, and 0.05% benzotriazole.

The following is an abbreviated summary of multiple biodegradation studies on FC-203C. These studies apply to a mixture with incompletely characterized concentration of impurities. Data does not necessarily reflect the biodegradation potential of the fluorochemical component of the test sample.

METHOD:

Methods: Specific methods not noted.

Type: Aerobic BOD and Carbonaceous BOD and Dichromate reflux COD

GLP: No

Year completed: 1981 - 1982

Contact time: 20 days

Inoculum: Activated sludge mixed liquors from various sources.

RESULTS

Chemical Oxygen Demand (COD) range: 730,000 – 950,000 mg/kg

Biochemical Oxygen Demand (BOD) range:

5-Day: 56,000 – 519,000 mg/kg

10-Day: 370,000 – 620,000 mg/kg

20-Day: 440,000 – 800,000 mg/kg

Carbonaceous-Biochemical Oxygen Demand (C-BOD) range:

5-Day: 47,000 – 357,600 mg/kg

10-Day: 140,000 – 580,000 mg/kg

20-Day: 410,000 – 730,000 mg/kg

Remarks:

These studies were conducted by various laboratories. Variability in the results may be due to the various methods used.

CONCLUSIONS

No reliable conclusions can be derived from this study. The indication is that the majority of the product components are readily biodegradable.

Submitter: 3M Company, Environmental Laboratory, P.O. Box 33331, St. Paul, Minnesota, 55133

DATA QUALITY

Reliability: Klimisch ranking 3. Study lacks description and records of the method followed. Inocula were not properly characterized. The testing was conducted on a mixture with chemicals having varying degrees of biodegradability, leading to potential misinterpretation of the results. The studies lack information on the purity of the test substance and lack actual measurements of the concentration of fluorochemical in the solution.

REFERENCES

Test was conducted by multiple vendors at the request of the 3M Company, 3M Lab Request Numbers 6811S, 7736, 7737, 7738, 7903, and 7625.

OTHER

Last changed: 6/26/00

LAB REQUEST NO. 7625
REQUESTOR NAME: EAR
DEPARTMENT: 0535
PROJECT NO: 9970012600
DATE RECEIVED: 01/13/1982
DESC: FC-203C & FC-206C

CONTRACT LAB(S):
EXP COMP DATE: 03/10/1982
DATE COMPLETED: 03/16/1982
PROJECT LEAD:
PHONE NO:
3M FAX NO: 651-778-6176

THESE ARE PROPOSED MIL-SPEC AFFF MATERIALS. PLEASE LET ME REVIEW COPIES OF
WORK SHEETS

SAMPLE	DATE	CODE	DESCRIPTION	RESULT	MDL or (95% C.I.)
1		FC206C	L-6518		
	BOD-05	BOD-05		28000 MG/KG	
	BOD-10	BOD-10		180000 MG/KG	
	BOD-20	BOD-20		290000 MG/KG	
	COD-RFX	COD (DICHROMATE REFLUX)		380000 MG/KG	
	FOAM-POT	FOAMING POTENTIAL		SEE ATTACHED REPORT	
2		FC203C	L-6519		
	BOD-05	BOD-05		56000 MG/KG	
	BOD-10	BOD-10		450000 MG/KG	
	BOD-20	BOD-20		580000 MG/KG	
	COD-RFX	COD (DICHROMATE REFLUX)		730000 MG/KG	
	FOAM-POT	FOAMING POTENTIAL		SEE ATTACHED REPORT	
3			DUP 1 (N-inhibited)		
	C-BOD-05	BOD-05 (CARBONACEOUS)		25000 MG/KG	
	C-BOD-10	BOD-10 (CARBONACEOUS)		120000 MG/KG	
	C-BOD-20	BOD-20 (CARBONACEOUS)		290000 MG/KG	
	COD-RFX	COD (DICHROMATE REFLUX)		360000 MG/KG	
4			DUP 2 (N-inhibited)		
	C-BOD-05	BOD-05 (CARBONACEOUS)		49000 MG/KG	
	C-BOD-10	BOD-10 (CARBONACEOUS)		300000 MG/KG	
	C-BOD-20	BOD-20 (CARBONACEOUS)		600000 MG/KG	
	COD-RFX	COD (DICHROMATE REFLUX)		740000 MG/KG	

06/19/2000

ENVIRONMENTAL LABORATORY
ARCHIVED FINAL REPORT

1

LAB REQUEST NO. 6811S
REQUESTOR NAME: EAR
DEPARTMENT: 0535
PROJECT NO: 9970012600
DATE RECEIVED: 04/29/1981
DESC: FC203C L5440 LOT 501

CONTRACT LAB(S):
EXP COMP DATE: 07/20/1981
DATE COMPLETED: 07/06/1981
PROJECT LEAD:
PHONE NO:
3M FAX NO: 651-778-6176

SAMPLE	DATE	CODE	DESCRIPTION	RESULT	MDL or (95% C.I.)
1		FC203C	CC814-28		
	48-HR-EC50	DAPHNIA ACUTE TEST		NO MORTALITY	
	96-HR-LC50	FISH ACUTE TEST - 96 HOUR		HOLD	
	BOD-05	BOD-05		SEE ATTACHED REPORT	
	COD	COD		776000 MG/KG	
	FOAM-POT	FOAMING POTENTIAL		SEE ATTACHED REPORT	
	IC50-ALGAE	ALGAE ASSAY - IC50		SEE ATTACHED REPORT	
	SLUDGE-TOX	SLUDGE TOXICITY		SEE ATTACHED REPORT	
2			DUP 1		
	COD	COD		771000 MG/KG	

000993

2nd Run

000994

mg/kg

700,000

TOTAL -VS- CARBONACEOUS BIOCHEMICAL OXYGEN DEMAND (BOD)

Sample Desc.: L-5440, LOT-501, CC-814-28

LRN: 68118

Analyst: V.A. Schell

Date: 6-23-81

600,000

500,000

400,000

300,000

200,000

100,000

▲ = TOTAL BOD

● = CARBONACEOUS BOD

AVERAGE OF SLIDING RESULTS

BOD5

BOD10

BOD20

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ULTIMATE BOD RESULTS-
calculated by two methods

Protocol reference:
EAR 2/29/80

ULTIMATE BOD RESULTS- calculated by two methods		BOD5				BOD10				BOD20			
Protocol reference: EAR 2/29/80		formula #4		formula #5		formula #4		formula #5		formula #4		formula #5	
1		TOTAL DEMAND											
2	Conc. of sample in BOD												
3	Dilution bottles:												
4	3.3 mg/l	85,000	mg/kg	180,000	mg/kg	556,000	mg/kg	555,000	mg/kg	567,000	mg/kg	630,000	mg/kg
5	6.7 "	160,000	"	158,000	"	556,000	"	555,000	"	576,000	"	603,000	"
6	10 "	127,000	"	125,000	"	556,000	"	555,000	"	614,000	"	635,000	"
7	13 "	103,000	"	101,000	"	548,000	"	548,000	"	-	"	-	"
8	20 "	96,000	"	95,000	"	-	"	-	"	-	"	-	"
9													
10	Average value -	*SLIDING RESULTS*											
11	(Rounded to 2 sig. figs.)	SLIDING RESULTS		SLIDING RESULTS		560,000 mg/kg		560,000 mg/kg		620,000 mg/kg		620,000 mg/kg	
12	⊕ = VALUES INCLUDED IN AVERAGE												
13													
14													
15	Conc. of glucose - glu-												
16	tamic acid reference												
17	solution in BOD dilution												
18	bottles:												
19	3.0 ml/300 ml	222	mg/l	220	mg/l	241	mg/l	240	mg/l	240	mg/l	260	mg/l
20	5.0 "	211	"	210	"	225	"	225	"	264	"	276	"
21	7.0 "	215	"	214	"	238	"	238	"	244	"	253	"
22													
23	Average value -	220 mg/l		210 mg/l		230 mg/l		230 mg/l		250 mg/l		260 mg/l	
24	(Rounded to 2 sig. figs.)												
25													
26													
27													
28													
29	NOTE: Formula #4 corrects for the DO depletion of the non-seeded dilution water blanks, and uses a												
30	seed control dilution to calculate the seed correction value.												
31	Formula #5 uses the seeded dilution water blanks to calculate the seed correction and to												
32	compensate for any DO depletion caused by the dilution water.												
33													
34													
35													

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4-26-82

ENVIRONMENTAL LABORATORY FINAL REPORT

LAB REQUEST NO. 7738

REQUESTER NAME: EAR
EPT: 0535
PROJECT NO: 9960012600
DATE RECEIVED: 2-23-82
DESC: FC-206C AND FC 203C MIL SPEC TESTING

CONTRACT LAB: CAPS
CONTRACT LAB COST: 450
3M E-L HOURS: 0
EST CMPLT DATE: 4-16-82
DATE COMPLETED: 4-23-82

SEE ALSO LRS 7625 7736 7737

SAMPLE	DATE	CODE	DESCRIPTION	TEST	RESULT
1		FC203C	LOT501 L6519	*BOD 05 *BOD 10 *BOD 20 *COD-RFX	140000MG/KG 540000MG/KG 570000MG/KG 950000MG/KG
2		FC206C	LOT502 L6518	*BOD 05 *BOD 10 *BOD 20 *COD-RFX	36000MG/KG 260000MG/KG 260000MG/KG 410000MG/KG
3		FC-780	LOT501	*BOD 05 *BOD 10 *BOD 20 *COD-RFX	24000MG/KG 220000MG/KG 240000MG/KG 360000MG/KG
4		FC203C	#1 INHIBITED	*BOD 05 *BOD 10 *BOD 20	63000MG/KG 480000MG/KG 620000MG/KG
5		FC206C	#2 INHIBITED	*BOD 05 *BOD 10 *BOD 20	32000MG/KG 260000MG/KG 320000MG/KG
6		FC-780	#3 INHIBITED	*BOD 05 *BOD 10 *BOD 20	20000MG/KG 210000MG/KG 230000MG/KG

* = CONTRACT LAB

APPROVED AND SUBMITTED BY



DATED

4-26-82

000997



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TECHNICAL DATA

April 16, 1982

Samples Submitted by: Minnesota Mining & Manufacturing Company

Samples Received on: February 24, 1982

Capsule Log #	12193	12194	12195
	203C	206C	780B
Sample Description:	7738-1	7738-2	7738-3
	Wt got 740,000 + 730,000 Sera got 737,000 us Navy got 740,000	3m got 360,000 + 360,000 Pac got 450,000 Sera got 370,000 Navy got 340,000	ck
COD	950,000 mg/kg	410,000 mg/kg	360,000 mg/kg
5 Day BOD Uninhibited	140,000 mg/kg	36,000 mg/kg	24,000 mg/kg
5 Day BOD Inhibited	63,000 mg/kg	32,000 mg/kg	20,000 mg/kg
10 Day BOD Uninhibited	540,000 mg/kg	260,000 mg/kg	220,000 mg/kg
10 Day BOD Inhibited	480,000 mg/kg	260,000 mg/kg	210,000 mg/kg
	Navy 517,000 Sera 440,000 3m 530,000	Navy 232,000 Pac 230,000 Sera 240,000 3m 270,000	Navy 237,000 Sera 320,000 + 210,000 Pac 250,000 3m 280,000 + 240,000
20 Day BOD Uninhibited	570,000 mg/kg	260,000 mg/kg	240,000 mg/kg
20 Day BOD Inhibited	620,000 mg/kg	320,000 mg/kg	230,000 mg/kg
	Navy 3m 600,000 Sera 440,000 Pac	290,000 260,000 370,000	230,000 220,000 250,000

000998

4-05-82

ENVIRONMENTAL LABORATORY FINAL REPORT

LAB REQUEST NO. 7737

EQUESTER NAME: EAR
EPT: 0535
PROJECT NO: 9960012600
DATE RECEIVED: 2-16-82
ESC: FC-206-C AND FC-203C MIL SPEC TESTING

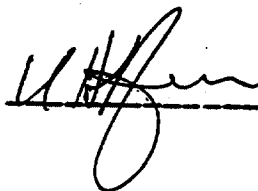
CONTRACT LAB: SERCO
CONTRACT LAB COST: 860
3M E-L HOURS: 0
EST CMPLT DATE: 4-06-82
DATE COMPLETED: 4-01-82

EE ALSO LRS 7625 7736 7738

SAMPLE	DATE	CODE	DESCRIPTION	TEST	RESULT
1		FC203C	LOT501 L6519	*BOD 05 *BOD 10 *BOD 20 *COD-RFX	130000MG/L 370000MG/L 440000MG/L 737000MG/L
2		FC206C	LOT502 L6518	*BOD 05 *BOD 10 *BOD 20 *COD-RFX	71000MG/L 190000MG/L 240000MG/L 370000MG/L
3		FC-780	LOT 501	*BOD 05 *BOD 10 *BOD 20 *COD-RFX	48000MG/L 160000 MG/L 210000MG/L 287000MG/L
4		FC203C	#1 INHIBITED	*BOD 05 *BOD 10 *BOD 20	58000MG/L 140000MG/L 440000MG/L
5		FC206C	#2 INHIBITED	*BOD 05 *BOD 10 *BOD 20	28000MG/L 65000MG/L 260000MG/L
6		FC-780	#3 INHIBITED	*BOD 05 *BOD 10 *BOD 20	21000MG/L 51000MG/L 220000 MG/L

* = CONTRACT LAB

APPROVED AND SUBMITTED BY



DATED

4-6-82

000999



1931 West County Road C2
Roseville, Minnesota 55113 (612) 636-7173

LABORATORY ANALYSIS REPORT NO: 263
03/18/82

PAGE 1

3M Company
Bldg. 2-3E-09 P.O. Box 33331
St. Paul MN 55133
Mr. Keith Hoffmann
Lab Coordinator

DATE COLLECTED:
DATE RECEIVED: 02/16/82
COLLECTED BY: CLIENT
PICKED UP BY: CLIENT
SAMPLE TYPE: PRODUCT SAMPLE

SERCO SAMPLE NO: 749 750 751
SAMPLE DESCRIPTION:

ANALYSIS:	FL 253C 7737-1	206C 7737-2	780B 7737-3
BOD, 5-day, mg/L	130000	71000	48000
BOD, 10-day, mg/L	370000	190000	160000
BOD, 20-day, mg/L	440000	240000	210000
BOD, carbonaceous, mg/L	58000	28000	21000
BOD, 10-day carbonaceous, mg/L	140000	65000	51000
BOD, 20-day carbonaceous, mg/L	440000	260000	220000
COD, Chemical Oxygen Demand, mg/L	737000	370000	287000

All analyses were performed using EPA or other recognized methodologies.

Report submitted by

Richard R. Dahl
Project Manager

< means "not detected at this level"

001000

SANITARY ENGINEERING LABORATORIES, INC.



5-04-82

ENVIRONMENTAL LABORATORY FINAL REPORT

LAB REQUEST NO. 7903

REQUESTER NAME: EAR
DEPT: 0535
PROJECT NO: 9970012600
DATE RECEIVED: 3-31-82
DESC: FC 206C FC-203C MIL SPEC TESTING

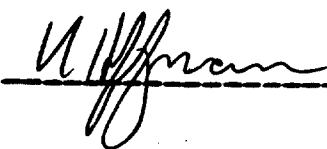
CONTRACT LAB: GAL
CONTRACT LAB COST: 368
3M E-L HOURS: 0
EST CMPLT DATE: 4-26-82
DATE COMPLETED: 5-03-82

THE PURPOSE OF THIS REQUEST IS TO TEST OUR EXPECTATION THAT THE CAUSE OF
GALBRAITH LAB'S HIGH BOD 20/COP RESULTS IS NITRIFICATION CAUSED BY THEIR BOD
SEED

SAMPLE	DATE	CODE	DESCRIPTION	TEST	RESULT
1	1-08-82	LT 501	FC-203C	*BOD 05 *BOD 10 *BOD 20 *C-BOD 05 *C-BOD 10 *C-BOD 20 *COD-RFX	519000MG/KG 520700MG/KG 615750MG/KG 253700MG/KG 557300MG/KG 671000MG/KG 776450MG/KG
2	1-08-82	LT 502	FC-206C	*BOD 05 *BOD 10 *BOD 20 *C-BOD 05 *C-BOD 10 *C-BOD 20 *COD-RFX	279300MG/KG 340700MG/KG 416500MG/KG 123700MG/KG 270700MG/KG 411000MG/KG 407250MG/KG
3		#1	FC-203C KNOX SEED	*BOD 05 *BOD 10 *BOD 20 *C-BOD 05 *C-BOD 10 *C-BOD 20	512800MG/KG 578300MG/KG 670000MG/KG 357600MG/KG 523700MG/KG 641000MG/KG
4		#2	FC-206C KNOX SEED	*BOD 05 *BOD 20 *C-BOD 05 *C-BOD 10 *C-BOD 20 *BOD 10	247700MG/KG 395500MG/KG 251800MG/KG 310500MG/KG 374000MG/KG 322500MG/KG

* = CONTRACT LAB

APPROVED AND SUBMITTED BY



DATED

5-5-82

001001



P. O. BOX 4187, 2323 SYCAMORE DR., KNOXVILLE, TENNESSEE 37921 / 615 548-1335

CERTIFICATE OF ANALYSIS

BEST COPY AVAILABLE

Mr. David Seely
3M Environmental Eng. & Pollution Control
Post Office Box 33331
St. Paul, Minnesota 55101

April 26, 1982

Received: April 1st

Dear Mr. Seely:

Analysis of your compounds gave the following results:

LR
7903-1

Your#	Our#	Analysis	
	WC-5045	COD	776,450 mg/kg

Seed A (derived from S & W Laboratories)

5 Day BOD 519,000 mg/kg
10 Day BOD 520,700 mg/kg
20 Day BOD $BOD_2/COD = .79$ 615,750 mg/kg
Carbonaceous BOD 5 253,700 mg/kg
Carbonaceous BOD 10 557,300 mg/kg
Carbonaceous BOD 20 $BOD_2/COD = .86$ 671,000 mg/kg

Seed B (from Knoxville Treatment Plant)

5 Day BOD 512,800 mg/kg
10 Day BOD 578,300 mg/kg
20 Day BOD $BOD_2/COD = .86$ 670,000 mg/kg
Carbonaceous BOD 5 357,600 mg/kg
Carbonaceous BOD 10 523,700 mg/kg
Carbonaceous BOD 20 $BOD_2/COD = .82$ 641,000 mg/kg

2

WC-5046 COD

407,250 mg/kg

Seed A (derived from S & W Laboratories)

5 Day BOD 279,300 mg/kg
10 Day BOD $BOD_2/COD = 1.02$ 340,700 mg/kg
20 Day BOD 416,500 mg/kg
Carbonaceous BOD 5 123,700 mg/kg
Carbonaceous BOD 10 270,700 mg/kg
Carbonaceous BOD 20 $BOD_2/COD = 1.01$ 411,000 mg/kg

001002



P. O. BOX 4187, 2323 SYCAMORE DR., KNOXVILLE, TENNESSEE 37921 / 615 546-1555

CERTIFICATE OF ANALYSIS

BEST COPY AVAILABLE

Mr. David Seely
Page 2
April 26, 1982

Your#	Our#	Analysis
2	WC-5046	Seed B (from Knoxville Treatment Plant)

5 Day BOD	247,700 mg/kg
10 Day BOD	322,500 mg/kg
20 Day BOD	395,500 mg/kg
Carbonaceous BOD 5	251,800 mg/kg
Carbonaceous BOD 10	310,500 mg/kg
Carbonaceous BOD 20	374,000 mg/kg

$BOD_{20}/COD = .97$
 $BOD_{20}/COD = .92$

Sincerely yours,

GALBRAITH LABORATORIES, INC.

Gail R. Hutchens

Gail R. Hutchens
Vice President

GRH:yd

001003

3-12-82

ENVIRONMENTAL LABORATORY FINAL REPORT

LAB REQUEST NO. 7736

EQUESTER NAME: EAR
EPT: 0535
PROJECT NO: 9960012600
DATE RECEIVED: 2-16-82
ESC: FC-206 C

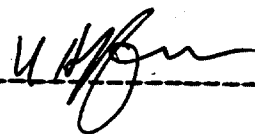
CONTRACT LAB: PACE
CONTRACT LAB COST: 310
3M E-L HOURS: 0
EST CMPLT DATE: 3-16-82
DATE COMPLETED: 3-12-82

SEE ALSO LRS 7625 7737 7738

SAMPLE	DATE	CODE	DESCRIPTION	TEST	RESULT
1		FC203C	LOT501 L6519	*BOD 05 *BOD 10 *BOD 20 *COD-RFX	500000MG/KGW 620000MG/KGW 800000MG/KGW 810000MG/KGW
2		FC206C	LOT502 L6518	*BOD 05 *BOD 10 *BOD 20 *COD-RFX	250000MG/KGW 300000MG/KGW 350000MG/KGW 450000MG/KGW
3		FC-780	LOT 501	*BOD 05 *BOD 10 *BOD 20 *COD-RFX	190000MG/KGW 210000MG/KGW 250000MG/KGW 350000MG/KGW
4		FC203C	#1 INHIBITED	*BOD 05 *BOD 10 *BOD 20	470000MG/KGW 580000MG/KGW 730000MG/KGW
5		FC206C	#2 INHIBITED	*BOD 05 *BOD 20 *BOD 10	240000MG/KGW 370000MG/KGW 300000MG/KGW
6		FC-780	#3 INHIBITED	*BOD 05 *BOD 10 *BOD 20	170000MG/KGW 210000MG/KGW 250000MG/KGW

* = CONTRACT LAB

APPROVED AND SUBMITTED BY



DATED

3-16-82

001004

3121 Nicollet Avenue □ Minneapolis, Mn. 55408 □ Phone: (612) 824-2675

April 15, 1982

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Mr. Dave Seely
3M Company
Building 2-3E
935 Bush Avenue
P O Box 33331
St. Paul MN 55133

Dear Dave:

Sample 7858-1 was analyzed for 5-day, 10-day and 20-day BOD and COD. The samples were analyzed with and without nitrification inhibitor. The seed bottles for the 10-day and 20-day seed correction were inadvertently not analyzed. Consequently, the 10-day and 20-day BOD's cannot be accurately calculated. The 5-day BOD, 5-day C-BOD and COD values were reported.

If you have any questions on the above, please contact me.

Sincerely,

Steve J. Albrecht
Steve J. Albrecht,
Laboratory Manager

SJA;jdm

FC 203C
COD 730 000 mg/kg

Internal Correspondence
cc: D. R. Ricker - 53-4N
D. L. Bacon/R. L. Bohon - 21-2W-05

To: J. A. PIGNATO - COMMERCIAL CHEMICALS LAB - 236-2A-01
From: E. A. REINER - ENVIRONMENTAL LABORATORY/EE & PC - 21-2W-5
Subject: MIL-SPEC AFFF BOD AND COD TESTING
Date: MAY 25, 1982

3M

Attached is a summary of the BOD, carbonaceous BOD, and COD test results on FC-203C, FC-206C, and FC-780B. This testing was conducted at the 3M Environmental Laboratory and four outside laboratories. The results were more variable than I had anticipated.

The Galbraith results on FC-206C were typical of their result from past testing, i.e., they had a very high BOD₂₀/COD ratio. This occurred despite the fact that some of this testing was done with a nitrification inhibitor (the C-BOD results) and some of the tests were done using a seed unlikely to contain a large population of nitrifying organisms (seed from the Knoxville waste treatment system). While I had previously thought that their results were due to nitrification, I must now say that I do not know why Galbraith gets such atypically high BOD results.

I plan to use the average data from all of these tests in preparing our Product Environmental Data Sheets and input for our Material Safety Data Sheets. If you have any questions concerning these data, please feel free to contact me on 778-5079.



EAR/mk

Attachment

001006

BOD, CARBONACEOUS BOD, AND COD DATA ON MIL-SPEC AFFF PRODUCT

<u>Lab</u>	<u>BOD₂₀</u> <u>(mg/kg)</u>	<u>C-BOD</u> <u>(mg/kg)</u>	<u>COD</u> <u>(mg/kg)</u>	<u>BOD₂₀</u> <u>COD</u>	<u>C-BOD₂₀</u> <u>COD</u>
<u>FC-203C Lot 501</u>					
3M	580,000	600,000	730,000	.79	.81
			740,000		
Pace	800,000*	730,000*	810,000		
			730,000		
Serco	440,000	440,000	737,000	.60	.60
Capsule	570,000	620,000	950,000	.6	.65
Galbraith	616,000	671,000	776,450	.79	.86
S & W Seed					
Galbraith	670,000	641,000	776,450	.86	.82
Knoxville					
Average	575,000	594,000	782,000	.73	.75
S. D.	85,000	90,000	80,000	.12	.12

* Calculated BOD's from different dilutions were very inconsistent. Pace agreed to repeat this work but inadvertently lost their repeated test results as well. We did not request a third testing nor did we include these values in the averages.

<u>FC-206C Lot 502</u>					
3M	290,000	290,000	380,000	0.78	0.78
			360,000		
Pace	350,000	370,000	450,000	0.78	0.82
Serco	240,000	260,000	370,000	0.65	0.70
Capsule	260,000	320,000	410,000	0.63	0.78
Galbraith	416,500	411,000	407,250	1.02	1.01
S & W Seed					
Galbraith	395,500	374,000	407,250	.97	.92
Knoxville					
Average	325,000	338,000	396,000	.81	.83
S. D.	73,000	57,00	33,000	.16	.11

<u>FC-780B Lot 501</u>					
3M	240,000	230,000	320,000	.74	.71
			330,000		
Pace	250,000	250,000	350,000	.71	.71
Serco	210,000	220,000	287,000	.73	.77
Capsule	240,000	230,000	360,000	.67	.64
Average	235,000	232,000	329,000	.71	.71
S. D.	17,000	13,000	28,000	.03	.05