

**Discharge of Perfluorocarbons (PFCs) from 3M Cottage Grove Plant
February 26, 2007**

3M discharges treated process wastewater and cooling water effluents from the 3M Cottage Grove plant to the Mississippi River. These discharges are authorized and limited under the NPDES (National Pollutant Discharge Elimination System) permit MN0001448. Process wastewater at the plant is directed to the plant's wastewater treatment plant which consists, in general, of chemical precipitation and clarification, and an activated sludge system. The incinerator scrubber blowdown is treated via a separate chemical precipitation system and is also directed to and monitored within the SD001 treated process wastewater discharge. The process wastewater discharge is called SD001 (surface discharge 001). Beginning in January 2004, pursuant to a requirement in the NPDES permit that was reissued in February 2003, the 3M Cottage Grove plant completed and began operation of an activated carbon treatment system. The activated carbon system was required to remove (APEs) alkyl phenol ethoxylates which had been found to be causing acute aquatic toxicity in the SD001 discharge. Activated carbon is also the most suitable technology applicable for removal PFCs in water and wastewater. After January 2004 all process wastewater was directed for treatment through the activated carbon system prior to discharge.

Cooling water is used at the plant in noncontact cooling water systems. The cooling water sources are from the Woodbury contamination site pumpout wells and the 3M Cottage Grove plant site wells. The Woodbury groundwater pumpout water is piped to the 3M Cottage Grove plant from the Woodbury site. The Woodbury pumpout groundwater not used for cooling at the plant is discharged via the plant's cooling water discharge SD002. All cooling water is directed to a pond for chlorination/dechlorination. No other treatment of cooling water is provided, and cooling water does not receive activated carbon treatment. The cooling water discharge is called SD002 (surface discharge 002). Both SD001 and SD002 discharge to a small creek adjacent to the 3M plant which enlarges into a cove and hence discharges to the Mississippi River.

PFC Discharge Data Prior to 8 Carbon PFC Phase Out Completion

Limited data was available on the concentrations of PFCs discharged to the Mississippi River from the 3M Cottage Grove plant prior to termination of production of the 8 carbon PFCs (PFOS and PFOA related PFC compound production), and prior to the use of the activated carbon system. In February 2002, in connection with drafting the reissued NPDES permit, MPCA water quality staff requested that 3M submit all available monitoring data 3M had for PFCs analyzed in the 3M discharge. (At that time the MPCA had no data for PFCs discharged from the 3M plant.) In February 2002, 3M submitted discharge data it had for PFCs analyzed in the SD001 discharge for samples collected in September-October 2001. Four years later in May, 2006, however, MPCA water quality staff discovered that other PFC discharge data existed for samples taken at SD001 by 3M in January through March 2001. 3M had not submitted this January-March 2001 data to the MPCA in 2002, as requested at that time. Pursuant to this discovery, MPCA requested that 3M submit the additional omitted PFC discharge data for SD001.

**Exhibit
2133**

State of Minnesota v. 3M Co.,
Court File No. 27-CV-10-28862

STATE_01995465

Subsequently in May 2006, 3M submitted data for PFCs in the SD001 discharge conducted during the January-March 2001 sampling period. (The omission of discharge data by 3M is a violation of state and federal rules pertaining to the NPDES program. An initial letter was sent to 3M regarding this issue in July, 2006 and the MPCA evaluation of this issue is pending.)

The following tables shows the range and average of concentrations for individual PFCs in the SD001 discharge for the period January-March 2001 and September-October 2001, in parts per billion (ug/l). These samples were taken during the phase out of the 8 carbon PFC production process. These tables therefore represent mass loadings of PFCs discharged from SD001 before the production phase out was completed and before the activated carbon system began operation. Production phase out of the carbon 8 PFCs was completed by the end of 2002, and since then PFC production at 3M Cottage Grove is based on a 4 carbon PFC, perfluorobutane sulfonate.

PFCs in SD001 Discharge in Jan-March 2001, During Phase-out of 8 Carbon PFCs

Jan-Mar 2001 data (for 8 weeks sampling)	Range ppb	Average ppb
PFOS perfluorooctane sulfonate	321 - 3970	1404
PFOA perfluorooctanoic acid	1320 - 4230	1991
PFBA perfluorobutanoic acid	197- 8170	2196
PFBS perfluorobutane sulfonate	6 - 3250	766
PFPeA perfluoropentanoic acid	<50 - 676	225
PFHxA perfluorohexanoic acid	32 - 320	124
PFHpA perfluoroheptanoic acid	21 - 65	33
PFHxS perfluorohexane sulfonate	10 - 31	18
Perfluoroheptane sulfonate	<10 - 10	
Perfluoropentane sulfonate	<10	
PFNA perfluoronanoic acid	No data	
PFDA perfluorodecanoic acid	No data	
PFUnA perfluoroundecanoic acid	No data	
PFDoA perfluorododecanoic acid	No data	
PFTA perfluorotridecanoic acid	No data	
Perfluoropropane sulfonate	<10	
PFOSA perfluorooctane sulfonamide	<10	
PFOSAA	24 - 131	72
EtFOSE-ETOH	<10 - 14	
MeFOSE-OH	<10	
Diester of FC-807	<10	
Cumulative average PFC compounds (ppb)		6828

PFCs in SD001 Discharge in Sept-Oct 2001, During Phase-out of 8 Carbon PFCs

September-October 2001 (for 3 samples)	Range ppb	Average ppb
PFOS perfluorooctane sulfonate	151 - 384	262
PFOA perfluorooctanoic acid	187 - 267	216
PFBA perfluorobutanoic acid*	845 – 6430*	3462*
PFBS perfluorobutane sulfonate	24 - 138	64
PFPeA perfluoropentanoic acid	<.100	
PFHxA perfluorohexanoic acid	26 - 32	29
PFHpA perfluoroheptanoic acid	12 - 19	15
PFHxS perfluorohexane sulfonate	11 - 12	11
PFNA perfluoronanoic acid	no data	
PFDA perfluorodecanoic acid	no data	
PFUnA perfluoroundecanoic acid	no data	
PFDoA perfluorododecanoic acid	no data	
PFTA perfluorotridecanoic acid	no data	
Perfluoroheptane sulfonate	<10 - 12	
Perfluoropentane sulfonate	<10	
Perfluoropropane sulfonate	<10	
PFOSA perfluorooctane sulfonamide	<10	
PFOSAA	38 - 39	39
Cumulative Average PFC Compounds (ppb)		4098

* PFBA in the Sept-Oct 2001 data was initially reported incorrectly in the February, 2002 data submitted to the MPCA; the values initially submitted were a range of 84.5 to 643.0 ppb, average of 346.2 ppb. This data was corrected by 3M in 2006 with submittal of the omitted Jan-March 2001 PFC discharge data.

Based on the January through March 2001 PFC discharge data, it is estimated that approximately 73,000 pounds of PFCs were discharged annually to the Mississippi River from the SD001 discharge from the 3M Cottage Grove plant. 3M did not analyze PFCs in the cooling water discharge SD002.

Current Discharge of PFCs from 3M Cottage Grove Plant at SD001

Pursuant to requirement of the NPDES permit 3M is required to monitor for 5 individual PFC compounds in its SD001 discharge on a monthly basis. This monitoring began in February 2003 after reissuance of the NPDES permit. The monthly monitoring beginning in February 2003 is also after the 8 carbon PFC production was terminated (end of 2002) and the activated carbon system became operational (in January 2004). The following table summarizes the monthly PFC monitoring data for discharge from SD001 for the years 2005 and 2006, and therefore represents PFCs in the SD001 discharge after the activated carbon system. Based on the 2005-2006 SD001 discharge data MPCA staff estimates that approximately 1070 pounds per year of PFCs are discharged from SD001, which is a substantial reduction in the mass load of PFCs discharged from SD001 compared to that found during 2001 during the 8 carbon PFC production phase out. (Note, however, that this estimate is based on only 5 PFC compounds currently analyzed.)

Summary of 2005 – 2006 SD001 PFC Discharge Concentrations for 5 PFCs

2005-2006 SD001 Discharge	PFOS	PFOA	PFBS	PHHxS	PFHA
2005 range of values, ppb	5.2	43.1	87.6	1.9	7.2
2005 average, ppb	0.4 - 16.5	.9 - 262.0	7.3 - 283.0	0.4 - 3.0	0.4 - 21.1
2006 range of values, ppb	1.9	5.1	40.6	1.1	2.4
2006 average, ppb	0.13 - 16.5	0.5 - 49.1	0.4 - 91.4	0.5 - 2.6	0.1 - 5.5

3M is required to monitor only the above 5 PFCs pursuant to the NPDES permit. However, the “MPCA Investigation of PFC Contamination in Minnesota Phase I Study” (Dr. Fardin Oliaei Report to Senate Environment Committee of February 2006) monitored other PFCs in the SD001 discharge. The following are data for samples collected in that investigation at the 3M Cottage Grove plant on June 27, 2005:

MPCA Phase I PFC Investigation, June, 2005, SD001 PFC Discharge Concentrations

PFCs in ppb	WWTP influent	GAC influent	GAC effluent	SD001 effluent
PFBA	178	100	58.10	80.60
PFPeA	1.92	2.35	3.13	9.96
PFHxA	1.72	2.10	3.76	9.27
PFHpA	<1.24	<1.24	1.09	2.35
PFOA	3.740	7.76	1.67	62.40
PFNA	<1.33	<1.33	<0.88	<0.88
PFDA	<1.28	<1.28	<0.85	<0.85
PFUnA	<1.27	<1.27	<0.85	<0.84
PFDoA	<1.26	<1.26	<0.84	<0.840
PFBS	3.30	26.1	169.00	10.40
PFHxS	11.00	10.00	1.16	3.48
PFOS	3.17	24.8	1.33	19.20
PFOSA	<1.24	<.124	<0.83	<0.82
Total PFCs	202.85	173.11	239.24	291.26

GAC is granular activated carbon (activated carbon) and WWTP is the influent to the wastewater treatment plant for process wastewater SD001, excluding the incinerator scrubber wastewater.

Discharge of PFCs from 3M Cottage Grove Plant at SD002 (Cooling Water)

3M does not monitor the cooling water discharge SD002 for PFCs. The only data known available for PFC concentrations in the SD002 cooling water discharge is from the "MPCA Investigation of PFC Contamination in Minnesota Phase I Study" (Dr. Fardin Oliaei Report to Senate Environment Committee of February 2006) which found the following PFC concentrations at SD002, for samples collected at the 3M Cottage Grove plant on June 27, 2005:

PFCs in ppb	SD002 effluent
PFBA	6.74
PFPeA	1.11
PFHxA	1.32
PFHpA	0.44
PFOA	4.01
PFNA	<0.05
PFDA	<0.05
PFUnA	<0.05
PFDoA	<0.05
PFBS	3.87
PFHxS	11.30
PFOS	1.67
PFOSA	<0.05
Total PFCs	30.46

Future PFC Monitoring at SD001 and SD002

On February 9, 2007, MPCA staff sent a letter to 3M which requires that 3M immediately begin monitoring 14 PFC compounds at both the SD001 and SD002 discharges on a monthly basis, to begin in February 2007. The expanded analysis will include PFBA, as well as 8 other PFC compounds in addition to the 5 currently analyzed. The MPCA believes that more complete analytical data is needed to be able to assess the impacts of the 3M PFC discharge, including discharge of PFCs from the SD002 cooling water discharge. The MPCA is also currently in the process of developing discharge criteria for PFOS and PFOA, expected to be completed within the next few months.

Don Kriens P.E.
Principal Engineer
Industrial Division
Minnesota Pollution Control Agency