



ENVIRONMENTAL RESOURCE GROUP

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MEMORANDUM

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TO:

Dave Douglas and Mark Rys

COMPANY:

Minnesota Pollution Control Agency

FROM:

Dan Comeau and Paul Book

DATE:

February 10, 2003

RE:

3M Cottage Grove; Area D1 Initial Groundwater Sampling Results

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NOTES/COMMENTS:

Enclosed are the laboratory analytical results from new monitoring wells (MW-101 and MW-102) which were recently installed at the D1 area of 3M Cottage Grove. The well locations relative to the D1 source location are shown on Figure 1.

Samples from the wells were collected by Environmental Resource Group, LLC (ERG) on December 3, 2002 and shipped overnight on ice to Exygen Research, Inc. (Exygen) for the requested analyses of eight fluorocarbon (FC) compounds.

**QA/QC**

As indicated to you previously, Exygen revised and re-issued its preliminary report due to quality assurance/quality control (QA/QC) issues. Seven of the eight requested compounds were successfully analyzed and quantified. QA/QC issues were associated with the C4 acid (Heptafluorobutyric acid) analyses. As indicated in Section 5.7 of the laboratory report, the C4 acid analyses had low spike recoveries and did not meet the laboratory protocols. Sample quantitation for the C4 acid is not reported in Exygen's final laboratory report.

**Flux Analysis**

Using the December 2002 sample analytical data from the new monitoring wells, ERG evaluated D1 FC groundwater flux to the Mississippi River, approximately 600 feet south of D1. The evaluation uses an overly conservative assumption that all FCs measured in the groundwater will discharge to the river without attenuation. This exercise will show that even when using very conservative assumptions, existing groundwater conditions will not cause exceedances of receptor risk.

The following relationship was used to estimate FC concentrations in the river:

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1000 IDS Center, 80 South Eighth Street, Minneapolis, MN 55402  
Phone: 612.339.4750 Fax: 612.339.4990

**Exhibit  
1881**

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

3MA00046947

1881.0001

$$\text{Concentration}_{\text{Aquifer}} * \text{Discharge}_{\text{Aquifer}} = \text{Concentration}_{\text{River}} * \text{Discharge}_{\text{River}}$$

**Hydraulic Conductivity (K)**  
**K = 27.7 gallons/day/ft<sup>2</sup>**

ERG used the hydraulic conductivity value estimated for the nearest site monitoring well (MW-13) by Roy F. Weston, Inc. in the February 1986 Final Remedial Investigation Report for Cottage Grove.

Using the selected plume width and hydraulic conductivity, the discharge was calculated for the aquifer:

	W = 300 (feet) K = 27.7 (gpd/ft <sup>2</sup> )
Aquifer Discharge =	2.493 gal/min

The discharge value used for the river is the lowest consecutive 7-day streamflow likely to occur in a 10-year period (7Q10). That value (obtained from \_\_\_) is 1.5 billion gallons per day or 1,041,667 gallons per minute (gpm). Based on the assumption that only half the flow of the river would mix with the aquifer, a discharge value of 520,833 gal/min was used in ERG's analysis.

Aquifer concentrations were based on analytical results from the December 2002 sampling event as summarized below:

	D1 Analytical Results - December 2002					
	Total SUM FCs		PFOA		PFOS	
	MW-101 (ppm)	MW-102 (ppm)	MW-101 (ppm)	MW-102 (ppm)	MW-101 (ppm)	MW-102 (ppm)
Sample	2.87810	.8855	.17000	.324.0	.32500	.3840
Lab Duplicate	2.95560	.9769	.18000	.404.0	.35600	.3940
Field Duplicate	2.77880	.9057	.17200	.369.0	.35800	.3360
Average	2.87083	.92270	.17400	365.67	.34633	.37133

  

Conc. <sub>Aquifer</sub> (Average ppm) =	2.8708	0.9227	0.1740	0.3657	0.3463	0.3713
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$$\text{Concentration}_{\text{Aquifer}} * \text{Discharge}_{\text{Aquifer}} = \text{Concentration}_{\text{River}} * \text{Discharge}_{\text{River}}$$

or

$$\text{Concentration}_{\text{River}} = \frac{\text{Concentration}_{\text{Aquifer}} * \text{Discharge}_{\text{Aquifer}}}{\text{Discharge}_{\text{River}}}$$

Analyte	Well	Groundwater Analytical Results (ppm) Dec. 2002	Predicted River Concentration (ppm)	Standards (ppm)	
				HBV	1.00E-03
Total SUM FCs	MW-101	2.8708	6.87E-06	HBV	1.00E-03
	MW-102	0.9227	2.21E-06	HBV	1.00E-03
PFOA	MW-101	0.1740	4.16E-07	HBV	7.00E-03
	MW-102	0.3657	8.75E-07	HBV	7.00E-03
PFOS	MW-101	0.3463	8.29E-07	HBV	1.00E-03
	MW-102	0.3713	8.89E-07	HBV	1.00E-03

The current Cottage Grove NPDES discharge standard for total FCs and the interim health based values (HBV) for PFOA/PFOS recently developed by the Minnesota Department of Health (MDH) are summarized above for comparison to the predicted river FC concentrations. There are no known users of the river for drinking water between Cottage Grove and the junction of the Mississippi and St. Croix rivers.

As shown above, ERG's evaluation of potential groundwater discharge effects to the river (given the FC concentrations present at D1 in December 2002) indicates groundwater FC levels at D1 should have no adverse effects on Mississippi River water quality.

ERG proposes conducting the second and final sampling of the two new wells at D1 the week of February 24, 2003. The analytical data from that sampling event will be provided to you when it becomes available.

Please contact Dan Comeau (612.339.2478) or Paul Book (612.339.4779) of this office or Todd Fasking at 3M (651.778.5344) if you have any questions or comments concerning the information provided in this memorandum.

Enclosures (As noted)

CC: Mr. Todd Fasking, 3M ET & SS  
 Mr. Mark Gaetz, 3M ET & SS