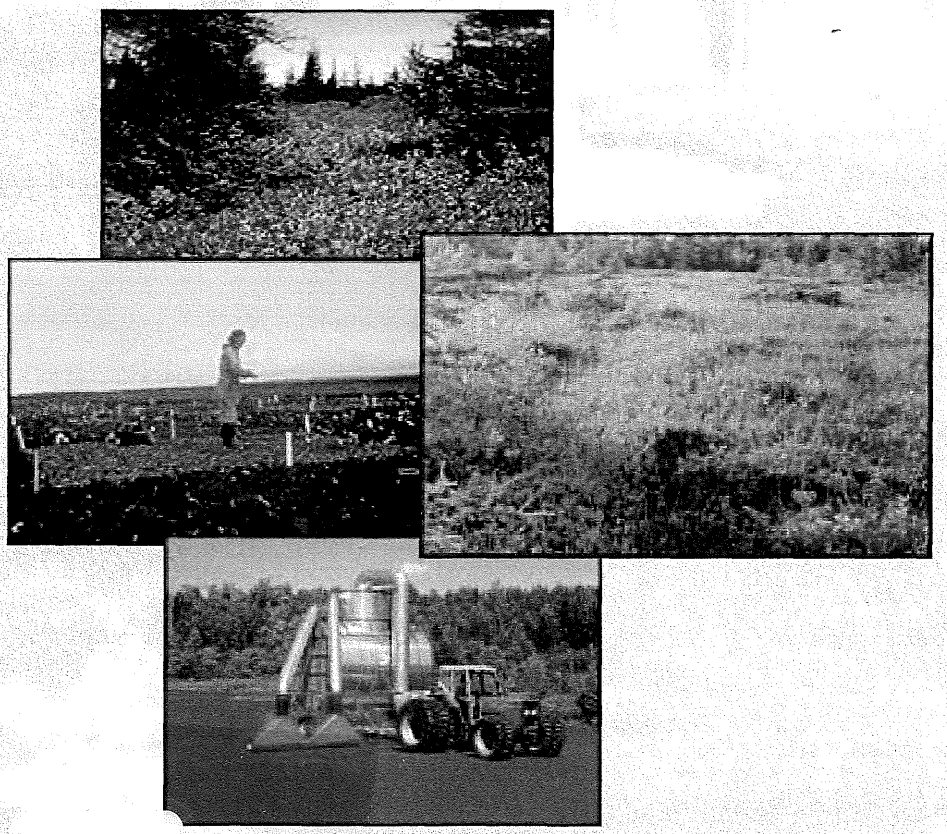
Pine Island Bog
Horticultural Peat Development
Koochiching County, MN

Final Environmental Impact Statement
December 2001



Minnesota Department of
Natural Resources

Final Environmental Impact Statement

Pine Island Bog Horticultural Peat Development

Prepared by:

Minnesota Department of Natural Resources
500 Lafayette Road, Box 10
St. Paul, Minnesota 55155

With Assistance From

HDR Engineering, Inc.
6190 Golden Hills Drive
Minneapolis, Minnesota 55416

Bemidji State University
Center for Environmental Studies
1500 Birchmont Drive, N.E.
Bemidji, Minnesota 56601

Freeberg & Grund, Inc.
208 Fourth Street, N.W.
Bemidji, Minnesota 56601

December 2001

Final Environmental Impact Statement
for the
Pine Island Bog Peat Horticultural Development
Koochiching County, Minnesota

Responsible Government Unit

Minnesota Department of Natural Resources

Contact Person

Rebecca Wooden, Planner Principal
Minnesota Department of Natural Resources
500 Lafayette Road
St. Paul, Minnesota 55155-4010
(651) 297-3355

Proposer

Berger Horticultural Products Ltd.

Proposer's Contact Person

Andreas Avenriep
Berger Horticultural Products Ltd.
121 R. R. 1
Saint-Modeste, Quebec
Canada GOL 3WO

Abstract

This Final EIS responds to timely substantive comments on the Draft EIS, provides information and analysis in addition to that contained in the Draft EIS, and corrects errors in the Draft EIS. Together, the Final EIS and the Draft EIS comprise the complete EIS, which documents the analysis of potential impacts associated with mining horticultural quality peat from the Pine Island Bog on state land in Koochiching County, Minnesota.

Certification of Responsible Governmental Unit

I hereby certify that the information contained in this document is true and complete to the best of my knowledge, and that copies of the Final EIS have been made available to all persons and parties who received the entire Draft EIS and any person who submitted substantive comments on the Draft EIS.

Rebecca Wooden 12/14/01

Rebecca Wooden, Planner Principal — Date
Environmental Review Section
Office of Management and Budget Services

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1.0 INTRODUCTION

Berger Horticultural Products, Ltd. Proposes to develop a horticultural peat mining and processing facility at the Pine Island Bog (PIB) in Koochiching County, Minnesota. The Proposed Project would also include a storage and shipping facility located three miles west of Big Falls, Minnesota. The Proposed Project would include 840 acres of commercial horticultural peat harvesting fields and portions of 320 acres north of the harvesting fields for drainage ditches and settling basins. Approximately 64 additional acres would be used for processing facilities and packaged peat storage areas adjoining the harvesting fields, and 39 acres would be used for the storage and shipping yard west of Big Falls. The project would require minor upgrading of the Pine Island Forest Road.

The project requires preparation of an Environmental Impact Statement pursuant to Minnesota Rules Part 4410.4400, Subpart 9.A. The Department of Natural Resources (DNR) prepared and distributed a Draft EIS (DEIS) for public review and comment. The public comment period began on July 23, 2001 when the Draft EIS Notice of Availability was published in the EQB Monitor. The public information meeting was held on August 20, 2001 at the Big Falls Community Center in Big Falls, Minnesota. The public comment period concluded on September 21, 2001. The DNR received nine comment letters on the Draft EIS as well as oral comments during the public information.

The Minnesota Environmental Review Rules require the Final EIS (FEIS) to respond to timely substantive comments on the Draft EIS consistent with the scoping decision and to include any necessary revisions to the Draft EIS. Section 2.0 of the Final EIS includes various corrections to the Draft EIS. Section 3.0 contains additional analysis and discussion of potential mercury discharges. Section 4.0 contains comments and responses from the public meeting in Big Falls. Section 5.0 contains responses to timely substantive comments on the Draft EIS. Appendix A contains the comment letters received. Appendix B contains a report by Edward Nater, Ph.D., who completed, under contract to the DNR, additional sampling and analysis for total and methyl-mercury at the Pine Island Bog.

The Final EIS and the Draft EIS together comprise the complete EIS for the proposed project.

The DNR will receive public comments on the adequacy of the Final EIS during a ten-day period commencing with publication of a Notice of Availability in the EQB Monitor. The Minnesota Environmental Review Rules indicate the Final EIS shall be found adequate if it:

A. addresses the potentially significant issues and alternatives raised in scoping so that all significant issues for which information can be reasonably obtained have been analyzed in conformance with Minnesota Rules part 4410.2300, items G and H;

B. provides responses to the substantive comments received during the draft EIS review concerning issues raised in scoping; and

C. was prepared in compliance with the procedures of the Act (Minnesota Environmental Policy Act) and Minnesota Rules parts 4410.0200 to 4410.6500 (the Environmental Review Rules).

2.0 DRAFT EIS REVISIONS

Note the following corrections, revisions and additions to the Draft Environmental Impact Statement for the Pine Island Bog Horticultural Peat Development, in Koochiching County, Minnesota.

Table 2-1, page 2-1, NPDES Permits, Status Section:

Add the underlined sentence to the table.

Table 2-1
Governmental Permits and Approvals

Unit of Government	Type of Application	Status
USACE	Section 404 Permit (Peat Mining)	Has been denied without prejudice until completion of 401 Action. USACE will review for reconsideration upon completion of EIS.
	Section 404 Permit (Pine Island Road Upgrade)	Has been denied without prejudice until completion of 401 Action. USACE will review for reconsideration upon completion of EIS.
	Section 404 Permit (Peat Storage and Secondary Processing Area – Site 5)	Has been denied without prejudice until completion of 401 Action. USACE will review for reconsideration upon completion of EIS.
DNR	Permit to Mine Peat	Application to be submitted.
	Water Appropriation	Application to be submitted.
MPCA	Air Quality Permit	Need for permit to be determined.
	Section 401 Certification	Has been denied. MPCA will review for reconsideration upon completion of EIS.
	NPDES Permits • Non-stormwater related discharges from site. • General Stormwater permit for industrial activity. • General stormwater permit for construction activity.	Application to be submitted. <u>The MPCA has identified the potential need for a variance request for mercury effluent limits.</u>
Koochiching County	Building Permit	Application to be submitted.
	Ditch Improvements (Pine Island Forest Road)	Application submitted.

Page 3-20, bottom paragraph:

1) The date of the cited reference, "Madsen and Cwikiel, 1988..." is incorrect. The cited reference should read "Madsen and Cwikiel, 1998...".

2) Replace the last sentence with the following underlined text: "Estimates of water table drawdown due to construction of perimeter ditches around the Pine Island Bog (see Draft DEIS Section 4.0) are consistent with these previous observations."

Page 4-5, paragraph 1, first two sentences:

The drainage areas of the Black and Sturgeon Rivers are incorrect. Replace these first two sentences, "The total drainage area for the Black River is about 350-375 square miles. Total drainage area for the Sturgeon River is about 200-225 square miles." with the following sentences: "The total drainage area for the Black River is about 255 square miles (Helgeson and others, 1975). Total drainage area for the Sturgeon River is about 322 square miles (Lindholm and others, 1976)."

Page 4-15, paragraph 1, entire paragraph:

Replace the first paragraph with the following underlined text: "Application of the groundwater flow model indicates that in years of average or higher precipitation levels, dewatering of the hemic peat layer will probably not extend beyond 60 feet from the ditch margins. However, if a surficial fibric peat layer is present, that fibric layer is expected to dewater greater than 160 feet from ditch margins. These estimates are consistent with measurements of drawdown adjacent to ditches within Minnesota peatlands by Boelter (1972) and Bradof (1992). Berglund (1985) monitored drawdown of the water table due to ditching in a peat mine near Cotton, Minnesota. He observed that water table was drawn down slightly beyond 80 m from the ditches only on the portions of the bog that sloped away form the mined area. In other areas of that bog, no significant drawdown due to ditching was observed beyond 80 m. These observations are also consistent with the estimates of potential drawdown due to ditching for the Pine Island Bog area. The predicted extent of dewatering in the hemic layer and the minimum extent of dewatering within the fibric layer (if present) within the Pine Island Bog area is illustrated in Figure 4-5."

Page 4-31, third paragraph, sixth sentence:

Complete the following incomplete sentence regarding pH with the underlined text: "An average pH of 6.6 in Pine Island Bog discharge water reported by Melchert et al. (1997), suggests that some mechanism, either groundwater flow, contact with mineral substrates or increased calcium carbonate buffering, causes pH to rise before the drainage water leaves the bog area.

Page 4-32, last paragraph, fifth sentence:

Replace the word "uncontaminated" with the word "typical" in the line "....concentrations reported for uncontaminated waters in Minnesota (Glass et al, 1992), and United States...".

Page 4-65, first paragraph, fourth sentence:

Revise and amend the sentences with the underlined text to read: "Hanson, et al. (1987), reported a flow of 220 ft3/sec in the Black River, 229 ft3/sec in the Sturgeon River, and 1,230 ft3/sec in the Big Fork River during fish surveys in 1986. However, the mean annual flow in the Black River is 31.85 cfs. Near its..... "

Page 4-82, full page:

Page 4-82 was missing from the July 2001 Draft EIS. Page 4-82 follows below in this report. Append it to the Draft EIS.

Glossary

Clarification of supernatant definition should be, "A usually clear liquid above material deposited by precipitation, centrifugation, or sedimentation."

4.3.13 IMPACTS TO TRIBAL LANDS

The Red Lake Band of Chippewa Indians (Red Lake Band) has jurisdiction over land in the vicinity of the Proposed Project. EIS scoping identified the potential for the Proposed Project to affect water quality and fishery resources of the Black River, thereby affecting the Red Lake Band's fish consumption. There were also concerns that the ditches installed as part of the Proposed Project could dewater tribal lands. The locations of the Red Lake tribal land between the Pine Island Bog and the Black and Sturgeon rivers are shown in Figure 4-17 and summarized in Table 4-15.

3.0 ADDITIONAL ANALYSIS OF POTENTIAL IMPACTS RELATING TO MERCURY RELEASE

During the Draft EIS public comment period, the DNR received a number of comments relating to the potential for mercury releases from the Pine Island Bog during mining, and the mercury-related information contained in the Draft EIS.

In response to the comments, and to provide additional information for use by project permitters, the DNR determined additional mercury-related sampling and analysis was necessary. The DNR and/or its EIS consultants contracted for additional mercury sampling at the project site, obtained additional mercury monitoring data from the MPCA, and obtained new bog discharge estimates from NRRI. The potential for mercury discharge from the mine site was reevaluated incorporating the new data.

3.1 MERCURY – GENERAL RESPONSE [1]

Mercury has been recognized to be an important environmental contaminant since the 1960's when various human poisoning events occurred, such as in Minamata, Japan. Some forms (species) of mercury are very biologically active, in that they are readily accumulated by organisms and/or they are neurotoxic. The organomercury compounds, especially methyl mercury, are the most bioaccumulative and toxic species of mercury, while the elemental (Hg°), ionic (Hg^{++}) or sulfide (HgS) forms are generally less dangerous as environmental contaminants. Organomercurials are produced by bacteria in anaerobic environments, such as peatlands, aquatic sediments and landfills, but this form of mercury may not persist in aerobic environments.

Methylmercury is not only bioaccumulated and stored by organisms, but it also biomagnifies, meaning that its concentration tends to increase as it moves from prey to predator, up the food chain. Thus, the highest concentrations and greatest risk of toxicity are found in top predators in aquatic food chains where methylmercury is being produced.

Although there are no known local sources of mercury near Pine Island Bog, the atmosphere contains a significant quantity of mercury that was released through combustion of coal and municipal garbage in upwind locations. The atmosphere has always contained some mercury because elemental mercury is volatile, but the concentrations in the atmosphere have increased greatly since the industrial revolution. A

[1] "Mercury – General Response" was prepared by subcontractors at Bemidji State University.

record of mercury deposition to Pine Island Bog from the atmosphere is shown in Figure 4-8 in the Draft EIS. Peatlands are sedimentary environments, meaning that layer after layer of peat is deposited over time, and the deposition of atmospheric contaminants is fixed in the peat layers, providing a record of contamination. Thus, Pine Island Bog has accumulated mercury and other contaminants over time, and there is potential for mercury release when a peatland is drained and mined.

In order to develop accurate estimates of the amounts and forms of mercury that could be released from Pine Island Bog, and to project the potential impacts in terms of increased bioaccumulation and risk to humans, a thorough understanding is required of mercury speciation in Pine Island Bog, its partitioning among particles and water, its transport to downstream systems and its speciation and partitioning downstream. Unfortunately, most of this information is not readily available for Pine Island Bog or any similar bog. Initially, we were unable to locate any published data on actual concentrations of mercury in the Black River. Data on mercury concentrations in Rainy River fish were provided by the MNDNR (Briggs, 2001), and we assumed that concentrations in Black River fish would be similar. Thus, an impact assessment was performed after many assumptions were made about mercury fate and transport, and the projections made under these assumptions were not very accurate.

Given the limited scientific understanding and the paucity of data available to us, we conducted three sampling events at Pine Island Bog, in October, November and December 2000, shortly after the EIS process was begun. Due to limited time and financial resources, a few water and peat samples were collected in December, 2000, to measure the concentrations of total and methylmercury in the discharge (outlet) from the bog; concentrations in the Black River; and mercury concentrations in the peatland. With these limited data, we were able to calculate the total amount of mercury in the bog and the loss of mercury from the bog in the discharge at this time of year. Based on: 1) the observed concentrations of mercury in Pine Island Bog peat, drainage water and the Black River in December, 2000; 2) an assumed flow rate of 4 cfs as observed in November 2000; and 3) an assumed loss of peat particles through surface runoff into the drainage ditches, we estimated that 10% of the total mercury in the bog would be exported downstream when the bog was drained. Concentrations of total and methylmercury downstream, in the Black River, after the bog is drained were projected on the basis of average flows in the Black River and dilution factors. This approach projected an initial increase of 28% and 55% for total and methylmercury in the Black River (Table E-3 Draft EIS), when surface peat deposits are drained, and lesser increases when deeper deposits are drained.

We recognized that these projections were very uncertain, because: they were based on one mercury sampling event in December; the assumed flow value of 4 cfs appeared to be high compared to previous

estimates of flow; and there was no accurate way to estimate surface erosion. Because there was so much uncertainty in these projections of concentrations downstream, we did not use them to estimate concentrations of mercury in fish downstream. Instead, we applied a computer model known as the Regional Mercury Cycling Model (RMCM) to project the distribution of mercury in water, sediment and biota downstream, under a range of pH and total organic carbon conditions, which control mercury partitioning and bioavailability. Under the observed pH and total organic carbon conditions downstream, (Realistic Case: Table E-5) the model projected that less than 0.1% of the total mercury in the system and about 2.5% of methyl mercury would be in fish. In other words, the model projected that the pH and total organic carbon conditions in the Black River did not favor the formation of methylmercury or its bioaccumulation.

Reviews of the Draft EIS were critical of the limited data available for an impact assessment, and of the use of the RMCM model. As a result of the controversy over the initial projections of mercury impacts, the MNDNR contracted a third party (Dr. Ed Nater, Department of Soil, Water and Climate, University of Minnesota) to sample and analyze mercury concentrations in peat water and drainage water of the Pine Island Bog. Samples were collected on September 18, 2001. Results of these analyses and previous analyses (December 2000 samples) are given in Table B-1 (Final EIS Appendix B). The mercury concentrations at sites 1 and 2 represent free water that would drain from the bog. The stream outlet is the drainage ditch north of the bog, and the NE ditch is a perimeter ditch in the bog.

The new analyses from September showed a discharge (outlet) concentration of total mercury (38.8 ppt) that is more than 10 times higher than that measured in December (2.4 ppt). The methylmercury concentration in the discharge was about 2.5 times higher in September. Curiously, the total mercury concentrations in free water in the peat (10-14 ppt) were lower than the discharge concentration, indicating that the sampling method used in peat may have excluded mercury-containing particles that drained from the bog. This was not the case with methylmercury, as the average concentration in free water (0.92ppt) was higher than the discharge concentration (0.72 ppt).

After the Draft EIS was published, we discovered that the MPCA had monitoring data on total mercury in water of the Black and Rainy Rivers (MPCA, 2001). These data (Table 3-1) show a large increase in total mercury concentrations in spring and summer, compared to winter. The MPCA value for February (2.77 ppt) is quite similar to the values we obtained in December (2.34 and 2.64 ppt), indicating similar precision. Also after the Draft EIS was published, we received new data (estimates) for flows from the Pine Island Bog (NRRI, 2001). The new flow values are about one-tenth the value used in the original

projections (4cfs), and the new total mercury values for Black River water are considerably higher in warm months.

Based on a combination of original and newly acquired data, the concentrations of total and methylmercury in the Black River, during the Pine Island Bog drainage, were estimated again (Table 3-2).

The projections in Table 3-2 were made under the following assumptions:

1) Mercury concentrations, speciation and partitioning in the free water of peat do not change during or after drainage;

2) No mercury is lost through volatilization, sedimentation or biological uptake in the 10 miles of drainage ditch connecting the Pine Island Bog to the Black River (i.e., all mercury discharged from the Pine Island Bog will reach the Black River).

3) No mercury is exported downstream in the form of eroded peat particles (i.e., these will be removed in the sedimentation basins).

Assumption #1 may lead to underestimates of the amount of total mercury discharged because it is generally assumed that drainage of bogs results in increased decomposition of peat which is exposed to air, thereby releasing the organically-bound mercury into the drainage water (Nater, 2001). However, drainage of the bog is expected to have the opposite effect on methylmercury concentrations, i.e., less will be formed because the aerobic conditions after drainage do not favor methylation. Thus the amount of total mercury released from the bog may increase and the concentration in the discharge may exceed the Minnesota Class 2B chronic standard of 6.9 mg/L, but the amounts and concentrations of methylmercury released from the bog may decrease after the bog is drained. This is a very important question because methylmercury is the only species of mercury that bioaccumulates and the conditions downstream seem to favor further losses of methylmercury.

Assumption #2 may lead to overestimates of the concentrations of methylmercury downstream in the Black River, because observations made in December 2000 show a reduction in methylmercury concentrations from 0.96 ppt in the perimeter drainage ditch to 0.29 ppt in the outlet and 0.18 ppt in the Black River. This reduction is expected because conditions in the drainage ditch (pH 6.6; high oxygen) favor demethylation.

The projected concentrations and percentage increases of total mercury in the Black River (Table 3-2) may be overestimates for other reasons as well. As mining progresses to deeper peat layers, the concentration of mercury in mined peat will decrease (Draft EIS Figure 4-8). Also, as mining progresses,

it is likely that the relationship between precipitation and runoff (discharge) from the bog will change, i.e. less precipitation will runoff directly and more will be held by the drained peat, and eventually lost back to the atmosphere via evaporation. Thus, flows used to calculate mercury concentrations downstream may be overestimates.

Rather than attempt to estimate each of the factors that could modify mercury speciation, partitioning or loss from the bog drainage, the projections in Table 3-2 assume no changes, and that all mercury released will reach the Black River. It may be more accurate to assume that the modifying factors cancel one another, rather than to introduce more uncertainty by attempting to estimate a number of unknowns.

Thus, under the given assumptions, the projected percentage increases in total mercury (0-15.7%) and methyl mercury (0-33.7%) in the Black River are considerably lower than those originally projected in the Draft EIS. However, the projected concentrations are higher than originally projected in the Draft EIS because the natural (background) concentrations during warm months are higher than expected. Based on MPCA monitoring data, it appears that the natural (background) concentrations of total mercury in the Black River may exceed class 2B chronic standards for mercury in warm months.

Table 3-1

Total Mercury and Methyl-Mercury in Pine Island and Black River

Sampling Site	Total Hg (ng/L)	Methyl-Hg (ng/L)	Me-Hg/Hg Ratio	Source	Month
PINE ISLAND RAW DATA					
Site 1 (6-10 cm)	9.96	1.66	0.167	Nater 2001	September
Site 1 (>1m)	13.21	0.96	0.072	Nater 2001	September
Site 2 (6-10 cm)	133.44 *	0.73	N/A	Nater 2001	September
Site 2 (>1m)	14.31	0.34	0.024	Nater 2001	September
Stream Outlet	38.83	0.72	0.019	Nater 2001	September
Stream Outlet	2.46	0.29	0.118	DEIS Table 4-5	December
NE Ditch	3.82	0.96	0.251	DEIS Table 4-5	December
PINE ISLAND DATA USED IN CALCULATIONS					
Average	13.76	0.81	0.109		
Minimum	2.46	0.29			
Maximum	38.83	1.66			
BLACK RIVER DATA					
Near PIB	2.34	0.18	0.078	DEIS Table 4-5	December
Near PIB	2.63	--		DEIS Table 4-5	December
Downstream	2.77	--	--	MPCA, 2001	February
Downstream	6.95	--	--	MPCA, 2001	May
Downstream	8.04	--	--	MPCA, 2001	June
Downstream	2.68	--	--	MPCA, 2001	October
BLACK RIVER DATA USED IN CALCULATIONS					
Average	4.23				
Minimum	2.34				
Maximum	8.04				

* This value was not used as it is a statistical outlier, and this sample may have been contaminated.

Table 3-2

Changes in Methyl-Mercury and Total Mercury in the Black River

Source	May	June	July	August	September	October
Pine Island Runoff (cfs)	1.07	0.59	0.67	0.99	0.80	0.28
Black River Average Flow (cfs)	44.87	48.00	32.73	29.11	29.88	6.54
* Dilution Factor	179.5	342.8	204.6	121.3	157.3	93.4

Potential Concentration of methyl mercury in ng/L and increase (%) in Black River when concentration of methyl-mercury in Pine Island Effluent is:

Average (0.81 ng/L)	0.194 (8.1%)	0.187 (4.2%)	0.192 (7.0%)	0.200 (11.5%)	0.196 (9.1%)	0.205 (14.3%)
Minimum (0.18ng/L)	0.180 (0.0%)	0.180 (0.0%)	0.180 (0.0%)	0.180 (0.0%)	0.180 (0.0%)	0.180 (0.0%)
Maximum (1.66 ng/L)	0.214 (19.1%)	0.198 (9.9%)	0.209 (16.5%)	0.228 (27.0%)	0.218 (21.4%)	0.240 (33.7%)

Potential Concentration of Total Mercury (T-Hg) in ng/L and increase (%) in Black River when Concentrations of Total Mercury in Pine Island Effluent and Black River are:

Average (13.76 & 4.23)	4.45 (5.2%)	4.34 (2.7%)	4.42 (4.5%)	4.54 (7.4%)	4.47 (5.8%)	4.62 (9.2%)
Minimum (2.46 & 2.34)	2.46 (0%)	2.46 (0%)	2.46 (0%)	2.46 (0%)	2.46 (0%)	2.46 (0%)
Maximum (38.83 & 8.04)	8.76 (8.9%)	8.41 (4.6%)	8.65 (7.7%)	9.05 (12.6%)	8.84 (9.9%)	9.30 (15.72%)

* In calculating dilutions and final concentrations, the following formula was used. $C_t = C_1V_1 + C_2V_2/V_t$

Where: C_t = final concentration in Black River (ng/L)
V_t = final flow (cfs)
V_1 = flow from PIB (cfs)
C_1 = mercury concentration in PIB effluent (ng/L)
C_2 = mercury concentration in Black River (ng/L)
V_2 = Black River flow (cfs)

Table 3-3

Current and Projected Total Mercury Concentrations in Water and Fish of the Black and Rainy Rivers

	Minimum	Mean (N) **	Maximum	Source
Current Concentrations				
Rainy River - Water (ppt) (Birchdale) - Walleye (ppm) * BAF	0.67 0.27	2.7 (4) 0.52 (11) 1.9×10^5	3.54 1.50	MPCA, 2001 MDNR, 2001 Calculated
Black River - Water (ppt) - Walleye (ppm)	2.34 0.44	4.23 (6) 0.80 (0)	8.04 1.53	MPCA, 2001 Estimated
Projected Concentrations				
Black River - Water (ppt) - Walleye(ppm)	2.64 0.47	4.47(0) 0.85 (0)	8.84 1.68	Estimated Estimated

* BAF = fish concentration/water concentration

** (N) = Number of data points available, calculated values have a (0).

Potential Impacts

Based on the available data for total mercury in water and walleye of the Rainy River (Table 3-3), we calculated a bioaccumulation factor (BAF), and we used that factor (1.9×10^5) to estimate the current concentrations of total mercury in Black River walleye (0.44 - 1.53 ppm). The estimated average concentration in Black River walleye (0.80 ppm) is rather high compared to Rainy River walleyes because the observed concentration in Black River water is high. The projected concentrations in Black River walleyes, during and after Pine Island Bog drainage, are based on the estimated increases of mercury in water (Table 3-2). These increases are generally less than 8%, depending on the monthly flows from the Pine Island Bog. When Pine Island Bog flows are lowest (October) mercury is projected to increase the most in the Black River, because Black River flows are very low and the dilution factor is low. The small increases in mercury expected downstream when the Pine Island Bog is drained will be a minor contribution to a river system already receiving substantial mercury from its watershed. Because of the very large dilution factor, no detectable increases in mercury are expected in the Rainy River from the drainage of the Pine Island Bog.

4.0 PUBLIC INFORMATION MEETING

On August 20, 2001, the DNR held a Public Information Meeting regarding the Draft EIS. The meeting was scheduled at the Big Falls Community Center, in Big Falls, MN, from 6:30 to 8:30 PM.

Approximately 50 people attended the meeting, including a number of representatives from the DNR and, the EIS consultant and its subcontractors.

Staff from the DNR outlined the EIS process and the information contained in the Draft EIS. The meeting was opened for questions or comments on the EIS. Meeting participants were encouraged to submit comments on the Draft EIS in writing, but were also invited to submit their comments as testimony at the meeting.

The comments and responses provided at the public meeting are summarized below. A transcript of the public meeting is available for review at:

Minnesota Department of Natural Resources
Office of Management and Budget Services
500 Lafayette Road
St. Paul, MN 55155-4010
(651) 297-3355

Copies of the transcript may be purchased from:

Braden, Undeland & Everson
Virginia, MN 55792
(218) 741-7624

Public Comment 1: Mr. Arnie Sutton asked whether regulatory agencies (specifically mentioning the U.S. Environmental Protection Agency, EPA) would focus on "negative" aspects of the project, such as water quality impacts, rather than on "positive" aspects such as economic benefits to Big Falls.

Response 1: In general, regulatory agencies do focus on regulated (negative) impacts and how to mitigate them. Although the EPA does not have a direct permit for the project, it will provide comments to the Corps of Engineers during Section 404 permitting.

Public Comment 2: Mr. Sutton asked whether there was any assurance that economic benefits would receive consideration in determining whether the project would be permitted; and also inquired as to whether the citizenry of Big Falls could provide input to those decisions.

Response 2: The EIS does not make permitting decisions, but provides information on project impacts to permitting authorities. State regulatory agencies are required to consider information contained in the State EIS; federal agencies are not. The economic information is part of that information. The DNR Permit to Mine Peat is a process open to public comment; the DNR is not certain whether other permits, such as the Corps of Engineers permit, include a public comment component.

Public Comment 3: Mr. Richard Lehtinen asked who would be writing the Corps of Engineers permit.

Response 3: The Corps of Engineers denied the permit, without prejudice, pending the completion of the state EIS. When the permit is reconsidered, the DNR believes it will be handled in the Brainerd office, with Jeff Koschak the primary Corps staff person assigned to it.

Public Comment 4: Mr. Larry Chezick asked whether the EIS included the recently released census data, which show Koochiching County to be one of the most distressed counties in the state. He further asked whether the EIS could be updated to reflect the recent data.

Response 4: The DNR will try to obtain the data and update the Final EIS.

Public Comment 5: Mr. Larry Chezick asked whether the 1.5 multiplier used in the economic analysis was conservative.

Response 5: As indicated in the Draft EIS, estimates of multipliers for rural areas in the Midwest vary widely to figures as high as seven, but tend to range in the vicinity of two. 1.5 is the lowest bound for multiplier effects.

Public Comment 6: Mr. Wally Pritchard asked for further explanation of the significance of the Pine Island Junction Site, which was identified in the archaeological and historical research completed as part of the Draft EIS.

Response 6: DNR staff read several sections of the Draft EIS describing the archaeological features at the Junction Site, which included several small depressions and a trash midden. It was explained that because the site is on State land it was necessary to inventory archaeological and resources that could be affected by the project.

Public Comment 7: Mr. Pritchard expressed his view that the Junction Site likely has no historic significance and that its presence shouldn't be used as a "negative tool" against the project.

Response 7: Comment noted.

Public Comment 8: Mr. Gary Bowman described past developments that have occurred near the project site, including logging, drainage, farming, a landing strip, etc., and expressed his view that the project site is not pristine. He also stated that the bog has been tested repeatedly and that the citizens are ready to see development.

Response 8: As indicated in the Draft EIS, a number of past development activities have occurred in the project vicinity and at the project site.

Public Comment 9: Mr. Pritchard stated that there was more wildlife in the project area when the ranger station was operational, and the area was being logged and managed, than there is now.

Response 9: Comment noted.

Public Comment 10: Mr. Bowman asked whether the Draft EIS makes clear that the bog will not be entirely drained to mine peat, specifically, that the water level is lowered just enough to harvest the peat.

Response 10: The Draft EIS indicates the water level will be gradually lowered throughout the project. The water levels must be high enough to support harvesting equipment and maintain moisture, but low enough to allow the top several inches of peat to dry.

Public Comment 11: Mr. Lehtinen asked whether regulatory agencies are obligated to use the findings of the EIS in permitting (the Corps of Engineers was provided as an example).

Response 11: State agencies must consider the impacts identified and mitigations recommended in the Draft EIS, but there is no requirement for federal agencies to defer to the state analysis.

Public Comment 12: Mr. Chezick asked what permits would be required in addition to the Corps of Engineers permit.

Response 12: The Draft EIS must identify all permits known to be required for the project. The permits are listed on page 2-1 of the Draft EIS (note: the list of permits was read aloud in response to the question).

Public Comment 13: Mr. Arnie Sutton stated that since horticultural peat products are generally used to retain water, this illustrates the water-retaining nature of peat bogs. He noted the water retention capacity of peat will make it less likely that all water will drain out of the bog.

Response 13: The DNR concurs. Peatlands are resistant to drainage. Past drainage efforts in the area for agricultural and other purposes have been unsuccessful; aerial photographs of the Pine Island Bog show existing drainage ditches, and the very limited changes in bog vegetation that have resulted.

5.0 RESPONSES TO COMMENTS

The DNR received nine comment letters on the Draft EIS during the public comment period. The Minnesota Environmental Review Rules require the Responsible Governmental Unit to respond to timely substantive comments on the Draft EIS that are consistent with the scoping decision. Responses to the comments are provided below. Photocopies of the comment letters the DNR received are included as Appendix A, with each comment marked. The comments are cross-referenced with the responses in this section.

In responding to a number of comments, the DNR indicates that no response is needed, or responds with the phrase "comment noted." Generally, these responses are used when the comment addresses issues beyond the scope of the EIS, is an expression of opinion rather than a comment on information contained in the Draft EIS, or the comment provides a statement of undisputed fact not requiring a response.

5.1 U.S. DEPARTMENT OF THE INTERIOR - FISH AND WILDLIFE SERVICE

Item 1

Comment noted. No response required.

Item 2

As indicated in the Draft EIS, a bond requirement will be imposed during project permitting.

Item 3

The degree of natural revegetation (in the absence of reclamation) varies from site to site. DNR's experience in Minnesota has been that there are two main factors affecting revegetation: the type of peat remaining at the site; and, whether the site is still draining. Reed-sedge peat tends to revegetate much more quickly than sphagnum peat. If a sphagnum site is still draining, it may take decades to revegetate. If a reed-sedge site is still draining, the speed of revegetation tends to depend on the proximity to a seed source. If the site is in a grassy or farmland-pasture type area, it will revegetate within a season or two (though it most likely will not be the same vegetative composition as pre-mining). For both reed-sedge and sphagnum sites, however, once ditches start to cave-in and plug, revegetation tends to proceed more quickly than without plugging. The progression tends to be from the edges of the mine to the center. On a smaller scale, the progression tends to be from the ditches to the center of the fields, with drought-tolerant species colonizing the crowns.

5.2 MINNESOTA POLLUTION CONTROL AGENCY

Item 1

The greatest potential for particulate emissions is associated with the vacuum harvesters. Additional communication with Berger Horticultural Products revealed they do have filter components which can reduce particulate emissions. Emissions control can be employed if emissions occur at a level which approaches ambient air quality standards beyond the property line or otherwise creates a potential nuisance off site.

Item 2

Fugitive dust control can also be employed for fugitive emissions from drying peat if such emissions show potential for creating ambient air quality problems off site. If the peat becomes so dry that fugitive dust is entrained in the wind, watersprays can be utilized to raise moisture content and reduce potential for entrainment. Requirements for dust control would need to be incorporated into project permits.

Item 3

Extensive baseline water quality information had been collected for the Pine Island Bog in the early 1990s. Since that time, however, mercury has become a greater concern, and the technology for detecting mercury at extremely low levels has improved.

Based on comments received from the MPCA during EIS scoping, the DNR included a requirement for mercury sampling and analysis in the EIS contract. The DNR notes that the MPCA scoping recommendation did not provide specific suggestions for a sampling schedule, or analysis protocol. Water quality sampling was completed in December 2000; analysis was included in the Draft EIS.

The DNR concurs that multiple samples taken during a variety of seasons would have been desirable. However, Responsible Governmental Units (RGUs) are constrained by the timeframes provided in Minnesota Rule. Two hundred eighty days are allotted for EIS completion after issuance of the EIS Preparation Notice (October 2, 2000). The bulk of data collection and analysis had to be completed during the winter months. It was not until the preliminary draft EIS was compiled and reviewed at the end of May, 2001, that the DNR became aware of MPCA concerns regarding the mercury data collection and analysis. The concerns specifically addressed the methodology used to project mercury impacts, but did not identify the lack of sampling over multiple seasons as a significant shortcoming.

After meeting with the MPCA during the Draft EIS public comment period, the DNR determined that additional sampling for mercury, and methylmercury specifically, should be completed and extended the EIS completion timeframe with the permission of the project proposer, which is required by rule (the EIS was originally due to be completed in July 2001). On the MPCA's recommendation, the DNR contracted with Dr. Edward Nater at the University of Minnesota to complete additional mercury sampling and analysis.. The MPCA had worked extensively with Dr. Nater on other peat/mercury projects. The earliest date for which mercury sampling at the remote project site could be arranged was mid-September, 2001. The Final EIS includes the data from this work.

The DNR notes that an EIS is not required to provide all information necessary for project permitting. Should it find that additional data are needed, the MPCA may impose additional mercury sampling requirements as part of its permitting process.

Item 4

The September 2001 samples were collected and analyzed by Dr. Nater (Dept. Soil, Water and Climate, University of Minnesota). His results showed total mercury concentrations in the discharge that were about 10 times those observed in December, and methyl mercury concentrations that were about 2.5 times higher. However, Dr. Nater's results did not show higher concentrations of total mercury in the free water of the peatland compared to the discharge as expected by the MPCA. In fact, the discharge (outlet) concentration was about 3x that in the free water. This anomaly could be due to a number of factors, including the choice of sampling locations/depths or the pore size of the sampler which may have excluded mercury-containing particles that move through the peat with the free water.

Item 5

The RMCM model was used in the Draft EIS because there were so few data on mercury concentrations, and because so many assumptions would have been necessary to conduct a mass balance; thus, the accuracy of the results would have been very uncertain. New data obtained from Dr. Nater's September 2001 samples, and from the MPCA (Table 2: Mercury-General Response) provide a much better basis for projecting mercury export from the Pine Island Bog and concentrations in the Black River.

Item 6

The question of particle settling rates in the sedimentation basins seems to have little bearing on mercury discharge to downstream waters. According to numerous studies, mercury tends to partition to colloidal or dissolved organic carbon to a much greater extent than to larger particles that would be expected to

settle out (e.g. Nater, 2001, MPCA, 2001). Thus, we assumed that settling would not reduce mercury discharge from the bog.

Item 7

The settling experiments done by BSU are reliable estimates of peat particle settling rates in the ponds because the Ca concentration of water used in these experiments (100 ppm) was lower than that required to initiate flocculation. The Ca concentration of the Pine Island Bog drainage water was about 15 ppm in December 2000.

Item 8

Clearly, there are many unknowns and assumptions associated with the projection of mercury export from the Pine Island Bog. Because these projections are uncertain, and because there are so many scientific questions regarding mercury fate and transport in peatlands, consultants for the DNR recommend that an intensive monitoring/research program be conducted at Pine Island Bog.

Item 9

As stated above, before the new data were received from the MPCA, only the December 2000 analyses of Black River water were available as background information for the Draft EIS.

Item 10

Mercury levels in Black River walleyes were projected using MPCA data on mercury in the Black and Rainy Rivers, and MNDNR data on mercury in Rainy River walleyes. A bioaccumulation factor (concentration in fish/concentration in water) was calculated for the Rainy River, and this factor was applied to the Black River to estimate concentrations in walleye (see Final EIS Table 3-3).

Item 11

As stated in Item 6, we conclude that settling of particles will not remove a significant proportion of mercury discharged from the bog, because mercury is more likely to be sorbed to colloidal and dissolved organic carbon. The estimates of mercury concentrations in water and fish of the Black River (see Final EIS Tables 3-2 and 3-3) assume no loss of mercury through settling in the ponds or ditches.

Item 12

The Draft EIS indicates that the perimeter ditches will be 8 feet (2.4 m) deep. The field ditches draining the peat harvesting will be about 4 ft (1.2 m) deep and presumably will be maintained at that depth as peat harvesting progresses during each phase of the mining. The Draft EIS does present a scenario in which accelerated drainage occurs in the first year after construction of the perimeter ditches for each phase of the mining project. We should emphasize that for almost all of the Pine Island Bog, no real data exist that pertain to the hydrologic characteristics of the peats—generalized hydrologic values are inferred based upon peat texture.

Information received from Berger does not specify exact depths of drainage ditches or water tables in the bog. However, as indicated in the Draft EIS (Table 4-5), the concentrations of mercury decline with depth in the bog, and, as the bog is drained to deeper levels, less mercury will be available for export. Although one could attempt to estimate the decrease in mercury available for export due to the concentration profile, and the increase in mercury available for export due to the increased rate of peat decomposition and mercury release, there are no extant studies of these phenomena to use as references; therefore, it is assumed these opposite forces cancel each other.

Item 13

The MPCA correctly notes the Draft EIS reflects uncertainty about the discharge point at which NPDES limitations would be imposed (i.e., where drainage water leaves the sedimentation ponds versus where the existing north-leading drainage ditch enters the Black River tributary). The DNR appreciates this clarification.

Regarding permitting generally, EIS Scoping identified information necessary to evaluate the potential significance of impacts and recommend mitigation. The EIS does not necessarily collect all information necessary for permitting. As noted in the EQB's "Guide to Minnesota Environmental Review Rules", "[t]he EIS is not a generic permit application: it does not replace permit applications or supporting data requirements. The proposer needs to file any necessary permit information directly with the permitting agencies."

Item 14

Comment noted. No response required.

Item 15

As stated in the Draft EIS the bulk of the discharge produced from mining will be due to removal of water that falls as precipitation. The peak discharge estimate produced by the NRRI did not include any precipitation that falls upon the settling pond areas or on the "capture zone" outside of the perimeter ditches that will be created due to groundwater drawdown outside of the ditches. New estimates of discharge rates are presented that assume that the entire mined area, settling basin area, and "capture zone" outside of the perimeter ditches will contribute to discharge.

The discharge estimates provided in Table 5-1 below are based on comparisons to the Corona Mined Bog (data from Brooks and others, 1982). The data for 1979 and 1980 indicate that an average of 46 % of the annual discharge from the mined bog occurred during the month of April, coincident with the snowmelt. The estimates are based upon an average annual groundwater recharge due to precipitation of 0.656 ft/year (200 mm/year) and they assume that all this recharge will ultimately discharge into the perimeter ditch system. The "capture zone" outside of the perimeter ditches is assumed to extend 164 feet (50 m) out from the perimeter ditches. Average discharge during the month of April is estimated to be about 6.5 cfs. However, actual discharge rates could be somewhat higher if most of the snow accumulated over the winter were to melt in a relatively short time.

Table 5-1

Estimates of Discharge Due to Snow Melt

Mine area	Area (ft^2)	Avg. discharge (cfs)	Est. runoff during snowmelt month (ft^3)	Avg. discharge during snowmelt month (cfs)
Phase 1	1.05×10^7	.218	3.15×10^6	1.22
Phase 2	1.05×10^7	.218	3.15×10^6	1.22
Phase 3	6.97×10^6	.145	2.10×10^6	.812
Phase 4	8.71×10^6	.181	2.63×10^6	1.02
Settling basins	1.39×10^7	.290	4.41×10^6	1.62
Perimeter capture zone	5.3×10^6	0.11	1.6×10^6	.618
SUM	5.05×10^7	1.16	1.68×10^7	6.50

Evaluation of peak discharges in response to summer precipitation events is more difficult to assess because peatlands typically delay stormwater runoff. Thus the discharge resulting from a rainfall event will be spread over more time, lowering the peak discharge rate. Stage data collected during the summer of 1991 from the drainage ditch just north of the Pine Island Bog (Melchert and others, 1997) can be compared with precipitation data, also collected at the Pine Island Bog. In general, stage levels began to increase soon after a rainfall event. Stage levels continued to rise slowly for about a day whereupon they began to slowly fall over a period of several days, commonly requiring 5 or more days to return to the original stage level. In general, drainage of the peat increases the storage capacity, which would be expected to extend the discharge period even more (Clausen and Brooks, 1980).

An estimate of discharge resulting from a 2-inch rainfall over 24 hours is presented below applying the following assumptions. About 30 percent of the precipitation ultimately is discharged into the drainage system—the remainder is lost to evapotranspiration. The discharge is spread over 5 days. The entire area of the mine, settling basins, and 164 foot-wide "capture zone" outside of the perimeter ditches is contributing to discharge. Precipitation events that occur during the dormant season when evapotranspiration is at a minimum are expected to have somewhat higher discharges.

Area contributing to discharge = 5.58×10^7 ft^2
Amount of water discharged due to precipitation event = 2 in X 30% X 1 ft/12 in.= 0.05 ft.
Total volume of discharge due to rainfall event = 5.58×10^7 ft^2 X 0.05 ft. = 2.79×10^6 ft^3.
Average discharge rate for 2 inch storm event = 2.79×10^6 ft^3/(5 days X 86400 sec/day) = 6.45 cfs

The DNR, the project proposer, and NRRI will continue to work with the MPCA during project permitting to develop final estimates of flows under peak facility operation.

Item 16

Discharge in normal operation is predicted to exceed 200,000 gallons per day (about 0.31 cfs) even with flow control structures in place. Through this EIS, the DNR will inform the project proposer of the potential requirement for a nondegradation demonstration.

Item 17

Comment noted. No response required.

Item 18

Comment noted. No response required.

Item 19

Table 2-1 has been revised to reflect this possibility.

Item 20

SS/DB The analyses of metals in the Pine Island Bog discharge during December 2000 were performed by the University of Minnesota Analytical Laboratory, using ICP. Since concentrations of cadmium, copper and lead were lower than detection limits, future analyses should employ a different analytical method. For reference, concentrations of these metals in Black River water are available from the MPCA (2001). These analyses show cadmium concentrations to be $\leq 0.03\mu$ g/L, copper $\leq 1.5\mu$ g/L and lead $\leq 0.5\mu$ g/L, all lower than class 2B standards.

5.3 MINNESOTA CENTER FOR ENVIRONMENTAL ADVOCACY

Item 1

The EIS provides information on conditions in and around the Pine Island Bog. Past activities affecting the bog are some of the facts provided. The EIS does not attempt to justify the project, as implied by this comment.

Item 2

The existing ditches can be assumed to be functioning to some degree because flow was observed and measured within them. No additional observations or measurements of the efficiency of the existing ditches were made due to limitations in available time and difficulties in accessing ditch localities. Eight foot deep perimeter ditches were assumed when the hydrologic impacts of mining were assessed in the Draft EIS.

The existing drainage ditches will be dredged and new ditches will be placed around each area to be mined in phases.

Item 3

Refer to information provided in Section 2.0, Draft EIS Revisions, "Page 4-15, paragraph 1, entire paragraph", on page 3.

In assessing the impacts upon surface waters, the Draft EIS estimates that ¼ of the drainage (as groundwater flow) from the proposed mining area currently drains southward, either discharging into the fen system or into the existing southward flowing ditch system. No data exist to document the hydrologic conditions within the fen system. Thus, we do not know to what degree the hydrology of the fen area depends upon shallow groundwater flow that will be "captured" during the mining process. There will likely be some minor flow in the fen area, especially in close to the proposed mining areas, but the extent of the impact cannot be quantified.

The comment accurately indicates that during the project life, all drainage will be directed to the north. The DNR expects original flow directions will be restored during post-mining reclamation. Expected flows in the drainage ditches do not represent all hydrologic flows in the project area. The bog drainage ditches will not eliminate all flow to the south, as indicated in this comment. Precipitation will continue

to fall on the bog, seep into lower levels of the peat, and flow in original directions out of the bog, either beneath the levels of the drainage ditches, or in groundwater flows.

The comment incorrectly states that the Draft EIS fails to acknowledge that there are currently no perimeter drainage ditches on the south end of the proposed project. Reviewers are referred to Page 3-20 of the Draft EIS where the following information is provided: "[a]t the Pine Island site, however, County drainage ditches already surround the proposed mining area on the west, north, and east sides. Berger proposes to use the existing ditches as the perimeter ditches for the Proposed Project, constructing a new ditch only along the southern mine boundary."

The comment states that Figure 4-5 shows the largest impact from dewatering for the project to be on the south side. Figure 4-5 depicts the minimum expected extent of dewatering of the surficial fibric layer of peat. The figure indicates there may be surficial dewatering up to 220 yards to the south of the southern perimeter ditch. This is not a demonstration of significant impacts to the fen area, which extends several miles to the south. The DNR notes that the term "fen" is often associated with unique ecological communities such as calcareous fens, which are protected in Minnesota. However, in peatlands, "fen" is a characterization of hydrogeology, formation and vegetation, and does not connote a unique resource requiring protection under statute or rule.

As indicated in the Draft EIS, the proposed project area constitutes an extremely small portion of the Sturgeon River drainage. The Minnesota Environmental Review Rules require that an EIS include data and analyses commensurate with the importance of the impact and the relevance of the information to a reasoned choice among alternatives. The Rules also limit the EIS analysis to the potentially significant impacts of the proposal. The RGU must consider the relationship between the cost of data and analyses and the relevance and importance of the information in determining the level of detail of information to be prepared for the EIS.

It is the DNR's considered judgment that the potential downstream effects of diverting drainage water to the north during project operation will be relatively minor. While the comment asks for more detailed information and analysis on potential impacts, the DNR believes that the potential impacts would not merit the considerable investment of resources required to acquire primary hydrogeologic data, and to model all conceivable impacts.

The Commenter is referred to the response to the Red Lake Band of Chippewa Indians, Item 6, for additional information regarding drainage and the hydraulic conductivities of peat.

Item 4

It is not possible to quantitatively assess possible habitat fragmentation effects in the absence of extensive data on animal movement patterns and a well-tested model of population dynamics related to landscape use. The data are not available, and the potentially relevant models are in their scientific infancy (Doak and Mills 1994, Hanski and Gilpin 1997). The following discussion must be considered as an instance of 'informed judgment'. As noted above, the raised bog environment is not a favored habitat for any large mammals, so it is likely that the Pine Island Bog is not frequented by large numbers of individuals. Removal of a single patch of little utilized habitat is not likely to lead to habitat fragmentation by itself, individual animals can simply avoid the Pine Island Bog and most probably do so already because the environment has little to offer in the way of resources. This is not to say that this kind of disturbance cannot lead to habitat fragmentation, but in the context of an otherwise more or less intact landscape the effect of the loss of a single patch is probably not great.

The two wildlife species listed as 'threatened' that may sometimes be found on the Pine Island Bog are the lynx and wolf. Potential impacts to these species, based on the discussion presented above, may be summarized as follows. Harvesting activities will probably result in wolves and lynx avoiding the Pine Island Bog area more than in the past; both lynx and wolf tend to avoid human activity when possible. Both species range over fairly large areas and they have low population densities in the peatlands region, so this will probably not affect many individuals of either species. Increased traffic on the access road could lead to more road kills, but road kills depend on the density of both vehicles and animals, and both of these densities will continue to be quite low for the area. The Pine Island Bog will probably be lost as usable habitat for these species until well into the foreseeable future; but this will probably have little effect as neither of these species favors this type of habitat due to low productivity of their prey. Habitat fragmentation effects, as noted above, are likely to be minimal for this particular project, but should be studied more carefully if this kind of development becomes common in Koochiching County. There are several other raised bog habitats within 10 miles of the Pine Island Bog (see section 4.3.3 below), well within the range of movement of large carnivores such as lynx and wolf.

The DNR concurs that habitat destruction throughout the world is a primary reason for songbird population declines.

Consistent with the scoping decision for the EIS, the Draft EIS includes a list of bird species commonly found in "closed conifer forests" although they are not necessarily found at the Pine Island Bog. The EIS also notes that low productivity communities such as raised bogs generally have low species diversity and a low abundance of birds. The Draft EIS indicates that virtually all potential habitat will be removed

from the site during the life of the project. As stated in the Scoping EAW (included as Draft EIS Appendix A), any birds that might have inhabited the project area will relocate to other areas with suitable habitat. If these areas are already at capacity, the displaced individuals will likely perish.

The EIS provides this information to project decision makers, including the DNR, for their consideration in determining whether the project should proceed.

Item 5

Please see responses to MPCA comments and Section 3.0, "Additional Analysis of Potential Impacts Relating to Mercury Release".

Item 6

This comment seeks a commitment that reclamation will fully restore all functions and values of the Pine Island Peat Bog. Environmental Impact Statements do not regulate projects or prescribe future actions; they provide information for project regulators. As such, this EIS provides a description of the proposed project, including a general reclamation plan proposed at this time. The EIS also describes currently acceptable reclamation techniques, and their estimated effectiveness. As portions of the proposed project are closed and reclaimed, it will be the responsibility of the DNR to require reclamation methods that consider best-available methodologies. At present, the Peatland Reclamation Rules include a number of post-mining management requirements (Minnesota Rules part 6131.0120). The DNR will adhere to these rules, or the rules in force at the time of reclamation. Although the DNR is committed to the orderly development and reclamation of peat mining projects, it is beyond the scope of the EIS to evaluate future, unknown reclamation goals and technologies. The DNR will hold project reclamation to the standard set in State policy and rule at the time.

The Peatland Reclamation Rules (Minnesota Rules Part 6131.0310) allow the Commissioner of Natural Resources to establish the amount of the performance bond based on a number of factors, including the annual performance of the operator, and the estimated cost of satisfactorily accomplishing reclamation of all lands disturbed and unreclaimed. The dollar amount is set on a site-specific basis but in the past has generally been at around $125.00 per acre. The DNR has found that this dollar amount is sufficient to minimally meet state regulations, which require the site to be reclaimed to wetland. Minimum reclamation would include plugging ditches (not filling them) and seeding with a standard reclamation mix if needed. The seed mix would likely include a cover crop (like winter wheat or annual rye) and facultative wetland grasses (like blue-joint grass, Virginia wild rye, and switch grass). In Minnesota,

some companies have found they cannot obtain a reclamation bond for their small operations. In these cases, the DNR receives an irrevocable letter of credit from the permittee. The amount of the bond that will be required for developing the Pine Island Bog will be determined during project permitting, and will be available as public information at that time.

Item 7

The comment correctly notes that the Draft EIS, describes a scale alternative that decreases the size of the mine to allow for a larger donor site. As indicated in the Draft EIS, the DNR believes, based on information from peat mining reclamation at other sites, that a donor site one-tenth the size of the reclamation site will be sufficient. Evidence has not been provided that a larger donor site is required, nor that potential environmental effects and benefits of an "in-between" option warrant amending the EIS scope to provide for additional analysis. However, this request will be conveyed, through the Final EIS, to project regulators, for consideration in permitting. The final determination of mine configuration, including size of donor sites, final mining footprint, and reclamation methodologies, will be made in the Permit to Mine, and will rely on impact-related information presented in the EIS, including public comments and responses to them.

As indicated in the Draft EIS, donor sites usually regenerate in three to five years allowing for several collections of donor plants with no subsequent loss of peatland vegetation. The vegetation cover is not removed from the donor site as it is from the mined area, and the donor site will not require restoration treatment. Only the top four inches of vegetation is removed from the donor site, allowing it to revegetate without intervention within three to five years.

Item 8

The DNR does not concur that the Draft EIS does not address economic costs of the project along with benefits. This comment misstates the manner in which costs are included in the economic analysis. Incremental costs for road improvements and upgrading beyond what is already budgeted in existing plans for roads in the area are indeed included in the cost calculations. The same is true for reclamation costs (as noted in response to Item 6.) Environmental and resource costs are found to be negligible based on the findings from the other sections of this EIS.

Section 4.2.4 of the Draft EIS includes a standard economic analysis of current economic conditions in the project area and anticipated impacts of the proposed project, including the costs of road upgrading.

Reclamation costs will be borne by the project developer; the Draft EIS describes per acre reclamation costs based on current technologies and information.

Regarding "externalities", EIS scoping determined the Draft EIS would not attempt to assign dollar values to intrinsic environmental values of the site, however, the Draft EIS did not discover significant environmental "costs" (degradation) that must be borne by the public. The comment ascribes a public cost when public resources are developed. The DNR acknowledges that the proposed project is an extractive use of a natural resource, similar to other mining activities, and that many centuries will pass before the bog returns to a pre-mining state. If the project proceeds, the State (and thereby its citizens) will benefit through the generation of royalties, lease payments, and increased tax revenues. The trade-off for these benefits is the alteration of the Pine Island Bog. The DNR notes that state agencies are charged with orderly development and management, as well as preservation when warranted, of public resources. Private development of the Pine Island Bog is compatible with State economic development policy. This trade-off decision between natural resource use and preservation is appropriately made by regulatory decision makers, guided by State policy, and informed by information in the EIS.

The comment correctly notes peat mining is seasonal and therefore the jobs created are likely to be part-time or seasonal. The comment characterizes the economic benefits of the project as minimal, and unlikely to improve overall unemployment in the region. This comment is noted and will be conveyed to project decision makers for use in considering whether to allow the project to proceed. The public cost for the described Pine Island Forest Road improvements is the dedicated $500,000 special appropriation (Chapter 404, Section 7, Subdivision 10, 1998 Laws of Minnesota). See page 4-95 of the Draft EIS.

Item 9

The comment suggests most of the benefit from the project will flow to the proposer, and recommends greater community investment on the part of the proposer to balance the "significant adverse impacts to the environment" and the "large public investment" in the project.

The DNR concurs the proposed project is a private, for-profit venture, with profits flowing to the developer. Through this EIS, the DNR will convey the recommendation for greater community investment to the project proposer, and Koochiching County, a project supporter. The EIS has not found "significant adverse impacts to the environment" that require mitigation through financial contributions to the community or other methods. Regarding the "large public investment" in the project, the allocation of $500,000.00 for road construction was a state-level policy decision made by the legislature that did not require a concomitant "community investment" by the proposer.

The totality of the EIS does not support a claim of "significant adverse impacts to the environment." Therefore substantial net economic benefits are projected to be yielded, a large portion of which should accrue to local citizens and communities.

Item 10

Multipliers are a standard component of economic analyses. The DNR does not concur with the comment that the multiplier should be eliminated as speculative. The EIS clearly indicates the multiplier used (which was conservative) so the reader can ascertain the benefits without multiplier effects.

Item 11

The DNR notes the MCEA's objection to the conclusion that no group will suffer a net loss. The MCEA asserts many groups may find they have suffered a net loss in helping to pay for a project that "destroys a large unfragmented habitat". The comment asserts that the concerns of the Red Lake Band of Chippewa, specifically, have been ignored. The Red Lake Band has strongly stated its objections to the proposed project. During EIS preparation, the DNR did not identify environmental or economic impacts to tribal lands or resources. The DNR acknowledges the Band's opposition, and concurs that if the project proceeds, it will be against their stated preference.

There is compelling evidence that considerable net benefits will accrue. These will be distributed to local people who will now be employed, to citizens and to Minnesota taxpayers through lease royalties and other revenues. As is noted in the Draft EIS on page 4-54, if environmental damages were to occur, there would be additional socio-economic costs. If there were environmental degradation, the Red Lake Band of Chippewa Indians would bear much of this burden. But being these claims are not supported by the EIS, the socio-economic evidence is that net benefits will be distributed so that no group will suffer a net loss.

5.4 MINNESOTA DEPARTMENT OF AGRICULTURE

Item 1

No response is required.

5.5 NATIONAL RESOURCES RESEARCH INSTITUTE - UNIVERSITY OF MINNESOTA

Item 1

As described on p. 4-52, estimates of rural multipliers found in the economics literature range from 1.5 to 7. But the weight of evidence supports estimates on the low end of this range, especially for rural areas that are not regional trade centers. The Economics Department at Bemidji State University has reviewed this literature rather extensively in recent years as part of multiple economic development projects and impact studies pertaining to northern Minnesota. The multiplier of 1.5 that is used is regarded as a cautious, best estimate. Using a multiplier of 3 would be overly optimistic and using a multiplier of seven would grossly overestimate economic impacts. If three were to be used, the direct expenditure of $3.5 million would yield a total impact of $10.5 million or twice the result reported based on a multiplier of 1.5.

Item 2

On page 4-46 of the Draft EIS, population decreases and projections through 2010 are provided. The conclusion supported by the population trends is that Koochiching County and the Big Falls area are in decline. To repeat these population figures, the population of the county in 1980 was 17,571; in 1990 it was 16,229. A 2.3 percent decline was reported for the 1990s through 1996 (to 15,858) with projected population in 2010 of 14,190. The 2000 Census figures show a more dramatic decrease than anticipated in that the total decline for the decade reached 11.5% to 14,335, almost as low as the projected drop by 2010.

Item 3

If the projected concentrations of mercury released from the Pine Island Bog or those expected in the Black River are deemed to be excessive by regulatory agencies, then a treatment system should be installed to reduce mercury concentrations downstream. The EIS consultants assumed that most mercury released from the bog in drainage water is associated with dissolved organics (e.g. humic substances) or very small particles that will not settle out in the sedimentation basins. Mercury that is associated with larger particles that are eroded from the bog surface may settle out. Thus, the challenge is to design a system that removes very small peat particles and dissolved organics, such as flocculation with aluminum, iron or polyelectrolytes.

5.6 RED LAKE BAND OF CHIPPEWA INDIANS

Items 1-5

The Red Lake Band of Chippewa Indians submitted comments on the Draft EIS in two parts: 1) a cover letter expressing opposition to peat development in the vicinity of Reservation lands, and to the project specifically, and stating their concerns regarding disruption of natural functions in the project area, and impacts to cultural and spiritual ties to the natural environment; and 2) an attachment commenting on specific potential project effects.

The Department recognizes the Red Lake Band of Chippewa Indians' long-standing opposition to peat development on or near Reservation lands. Environmental Impact Statements do not approve or deny projects, determine project merit, impose permit restrictions, or require mitigation. Their purpose is to provide information on project impacts to regulators and the public. Through inclusion of this letter, the EIS will convey the Band's opposition to project decision makers.

Responses to the specific comments attached to the cover letter are provided below.

Item 6

The lateral extent of drainage of the peatlands adjacent to the ditches is primarily determined by the thickness of the fibric peat layer, the hydraulic conductivity of that fibric layer, and the amount of recharge water provided by precipitation events. If the fibric layer is thin or has a relatively low hydraulic conductivity, the likelihood of extensive dewatering away from the ditches is lessened. If the fibric layer is thick or has a relatively high hydraulic conductivity, lateral drainage will be greater. During dry periods, drawdown will be greater—during wetter periods, drawdown will be less. If fibric peats are absent or materials having lower hydraulic conductivity than fibric peat are present in any of the areas where dewatering due to drainage might be a potential problem, the lateral extent of drainage will be lessened.

No field data are available for the hydraulic conductivities of fibric peat within the Pine Island Bog area. However, some data are available on the thickness of fibric peats in the peatland areas surrounding the Pine Island Bog (Minnesota DNR, 1988; Minnesota DNR, 1980). These data indicate that with the exception of some thick fibric peats just south of the proposed mining area that were noted in the Draft EIS (see Figure D-4, Appendix D), fibric peat thickness is typically 0.3 m (about 1 foot) or less.

Some additional estimates of potential dewatering due to ditching were made by applying the groundwater modeling software. These estimates illustrate how high the hydraulic conductivity of the fibric layer would have to be before drainage would occur 400 m from the perimeter ditches. The following hydrologic conditions were used in the model drawdown simulation:

- The fibric layer is present everywhere and is 0.3 m thick except in areas where we know the thickness is greater.
- The hydraulic conductivity of the fibric layer is equal in all directions and is the same everywhere (there are no areas of low hydraulic conductivity material present). As mentioned in the Draft EIS, fibric peats have hydraulic conductivities greater than 1.5×10^{-5} m/s
- Recharge due to precipitation was modeled using two recharge rates—130 mm/yr and 200 mm/yr.
- The ditches are open and receive water efficiently.
- A summary of the modeling results is presented below.

Table 5-2

Summary of Estimates of the Extent of Dewatering Due to Ditching within a 0.3 m Thick, Homogeneous Fibric Peat Layer

Modeled hydraulic conductivity (m/s)	Annual recharge due to precipitation (mm/yr)	Modeled lateral extent of dewatering due to ditching (m)
1.5×10^{-5}	130	68
1.5×10^{-5}	200	54
6.0×10^{-5}	130	167
6.0×10^{-5}	200	116
1.5×10^{-4}	130	225
1.5×10^{-4}	200	207
6.0×10^{-4}	130	400
1.3×10^{-3}	200	400

Direct application of the modeled results to dewatering due to ditching is not possible because of the absence of field data pertaining to hydraulic conductivities and the distribution of fibric peats outside of the proposed mining area.

Item 7

Drainage effects outside of the project perimeter are expected to be limited and not likely to warrant mitigation. For the new drainage ditch on the south side of the area to be mined there is greater potential for drainage effects to extend out 400-500 feet. However, the effect decreases with distance from the ditch. While there may be some subsidence it will be greater near the ditch and lessen with distance. The effects will be confined to state lands adjacent to the leased area. The effects can be monitored but are not expected to warrant mitigation.

Item 8

As to subsidence, the peatland reclamation rules, MR6131.0110 (Mine Design) Subp. 2. C.(2) require dewatering and ditch design such that "adjacent peatlands shall not be dewatered to the extent that the value of the resource is diminished".

Item 9

We agree peatland subsidence should be monitored. We do not expect effects to require mitigation.

Item 10

The settling basins, if operated properly, should remain aerobic and not be conducive to mercury methylation, which occurs under anaerobic conditions, in the presence of sufficient sulfate. Sulfate appears to be low in the bog waters (Nater, 2001). As stated in Section 3.0, "Additional Analysis of Potential Impacts Relating to Mercury Release", methylation rates and concentrations of methylmercury in the discharge are expected to decrease after initial bog drainage.

The commenter is referred to Section 3.0, "Additional Analysis of Potential Impacts Relating to Mercury Release", for additional information on mercury effects.

Item 11

Apparently, there is a temperature effect on mercury released from bogs, as indicated by the seasonal changes in mercury concentrations of Black River waters (Final EIS Table 3-2). Sulfate concentrations

can be a limiting factor on methylation rates, and data collected by Nater (2001) indicate that sulfate concentrations were very low in the bog water (0.07 ppm). Although sulfate concentrations were higher in the ambient Pine Island Bog discharge (1.28 ppm), pH and oxygen conditions downstream do not favor methylation of mercury.

Item 12

Samples were collected originally in December 2000, and again in September 2001, under different flow and temperature conditions. The total mercury concentrations were much higher in September compared to December, perhaps as a result of temperature differences between these sampling periods. Theoretically, peat decomposition and mercury methylation rates should increase as temperature increases, and the observed total mercury concentrations seem to follow this expected trend. However, the increase in methyl mercury concentration in September was not proportional to the increase in total mercury, perhaps indicating that low sulfate concentrations were limiting methylation rates. Additional data on Black River mercury concentrations each season were obtained from the MPCA, and these data were applied to revised projections.

Item 13

Section 3.0, "Additional Analysis of Potential Impacts Relating to Mercury Release", "Mercury-General Response", provides a revised projection of mercury concentrations downstream in the Black River.

Item 14

The commenter is referred to Section 3.0, "Additional Analysis of Potential Impacts Relating to Mercury Release", for additional information on mercury effects.

Item 15

The Band recommends ongoing monitoring for methyl mercury, and correctly notes the Draft EIS does not include a mercury sampling schedule or timetable for monitoring. The EIS provides information on the potential for methyl mercury release, and recommends on-going monitoring during mining. Specific discharge limits and monitoring requirements will be developed by the MPCA during project permitting.

Item 16

The Band recommends that discharge from the site be timed to minimize methyl mercury releases, and that mining and discharge cease if EPA-authorized levels are exceeded. These recommendations will be conveyed to the MPCA for consideration during project permitting.

Item 17

The Band recommends that the drainage system be reviewed prior to permitting to ensure there is a provision for shutting off any discharge. The DNR will complete this review during Permit-to-Mine development. Although bog drainage could not be stopped on a permanent basis (precipitation-derived water would eventually breach control structures), drainage could be stopped temporarily, if warranted.

Item 18

Conditions in the settling basins should remain aerobic, without additional oxygenation. If not, aeration can be provided.

Item 19

Monitoring requirements are established by the MPCA and other permitting agencies. The information in the comment letter and EIS will be conveyed to them for their consideration in project permitting.

Item 20

Monitoring requirements are established by the MPCA and other permitting agencies. The information in the comment letter and EIS will be conveyed to them for their consideration in project permitting.

Item 21

As indicated in the Draft EIS, there is little recreational use of the proposed project site, occurring primarily during hunting seasons. The DNR does not expect off-road recreational use in the project vicinity to increase due to the proposed project, although road upgrading may make the Pine Island Road between Gates Corner and the mine site passable for a greater portion of the year (primarily in spring and summer). There are no Tribal lands adjoining the section of the road to be upgraded.

The Pine Island State Forest is designated as "managed" for off-highway vehicle (OHV) use, which means that there are currently no restrictions on OHV use at the project site. When the project is

developed, the site will be closed to OHV use. The proposed project layout includes several drainage ditches, including perimeter and parallel field ditches. This not expected to be conducive to recreational use of the site. The DNR recommends the project proposer post "no trespassing" signs at the entry point.

The DNR does not have a basis for predicting whether trespass and poaching will increase due to project closure, in 30-plus years. Under current Minnesota Rule, a mine deactivation plan will be required prior to closure. The plan will require removal of any roads, parking areas, or storage pads that may have been constructed during the mining operation. The DNR thus anticipates that access to the project site will decrease post-closure.

The DNR notes the Band's comment that the project proposer should be held liable in the event that the "increased access to the general area" proves to create any immediate increase in trespass on surrounding lands. In preparing the EIS for the proposed project, the DNR has not found evidence that increased trespass is likely to occur.

Should additional site security be warranted in non-operating months, the economic surplus generated from the sale of products produced from the operation would be sufficient to fund security staff.

Item 22

Comments submitted by the Red Lake Band of Chippewa Indians correctly indicate that a County Biological Survey has not been completed for Koochiching County. County Biological Survey priorities are established by the State Legislature and available funding. Survey work has been completed in 50 of Minnesota's 87 counties.

During EIS Scoping, the DNR determined that a biological survey of the project site was not warranted. The DNR relied on extensive background information and staff knowledge of the plant and animal species inhabiting ombrotrophic bogs, including the Pine Island Bog. A site survey may have been recommended if evidence existed that threatened or endangered species (requiring a "takings" permit from the DNR) would be removed by the proposed mining. The Final Scoping Decision for the EIS (September 2000) indicated the EIS would describe the plant communities and wildlife resources of the Pine Island Bog, and potential impacts to them. This information is included in Draft EIS sections 4.2.1 and 4.2.3.

Item 23

As indicated in the Draft EIS, raised bogs support a limited number of vascular plants (less than 20), with sphagnum mosses the predominant ground cover. The mine site will be revegetated with plants from an adjacent donor site, ensuring the reintroduction of native species.

The DNR concurs with the Band's assessment that there is a "significant difference between a mined-out cell that has a floating mat of sphagnum at its surface and the fully-functioning bog ecosystem that once was located in its place." Consequently, reclamation will be staged, with carefully controlled water levels, to allow for gradual sphagnum growth. If, instead, the mine site were permitted to flood, growth of emergent vegetation, such as cattails, would be more likely to occur.

Based on the training and experience of DNR personnel in plant and soil sciences, extensive experience with inventorying and assessing peat resources during the multi-year peat project of the late 1970's, and extensive scientific literature, the DNR does not concur with the Band's assertion that low-pH environments, such as the Pine Island Bog, "typically harbor a number of rare or endangered species of plants and animals".

The proposed project is not exempt from Minnesota's Wetland Conservation Act. The Wetland Conservation Act delegates mitigation requirements for peat mining operations to the Permit to Mine. Under the Permit to Mine, a loss of functional value of wetlands is allowed during mining, with the assurance that the site will be returned to wetland when mining has ceased, achieving a no-net-loss of wetlands. The "no-net-loss" standard will apply to all wetland acreages affected by the project, not just the 840 acres proposed for mining.

While the site restoration requirements in Minnesota Rules Chapter 6131 allow for some flexibility in determining the final configuration of the restored site, the reclamation plan for the proposed Pine Island Bog mine site is designed to eventually restore pre-mining conditions.

Item 24

The comment requests that a time limit be established in the Permit to Mine, by which time reclamation activities must commence. This comment relates primarily to permit stipulations and compliance, and will be conveyed to the DNR Division of Lands and Minerals for consideration in permit development, and on-going permit enforcement.

Item 25

The comment reflects the requirement in Minnesota Rules Part 6131.0120 for a 75 percent live vegetative cover composed of wetland or typical peatland species that are either planted or naturally occurring during the fourth and fifth year following initiation of revegetation. The vegetation must be self-sustaining, and either regenerating or in a stage of natural succession. The comment's recommendation for permit monitoring and enforcement, and for standards exceeding those required in rule, will be conveyed to the project permitters for consideration in permit development, and on-going permit enforcement.

Item 26

The comment recommends the County lease an area equal to the mine size to set aside as a restoration reserve. The rationale for this type of recommendation was considered in the Draft EIS as a "scale" alternative in Section 3.2.3. The EIS did not find potential impacts or reclamation obstacles warranting either a doubling of the leased area or halving of the mined area within the current lease area to set aside a "restoration reserve" equal to the mine area. The rules of the Environmental Review Program allow exclusion of alternatives if the alternatives would not likely have any significant environmental benefit compared to the project as proposed.

The comment references a 1998 Draft EPA publication in support of the recommendation that an area of peatland on the applicant's property equal to the area to be mined should be set aside untouched as a restoration reserve. The 1998 report was a review draft that was reissued in February 2000 as a final report. The DNR reviewed the draft report and found a number of flaws indicating a lack of knowledge about peatland environments and hydrology, and little reflection of the peat mining and regulatory experience in Minnesota. As an example, on the first page of chapter one, the report stated "[m]inerotrophic peatlands (typically referred to as bogs) receive water from precipitation that has percolated through mineral soils. As such, these peatlands are more productive and support a different assemblage of plants and animals." In fact this is a description of a fen, not a bog. While the final report corrected this egregious error, few substantive changes were made from the draft.

The report focuses on peat mining in Michigan and paints a worst-case scenario by describing impacts of large-scale peat mining when left unregulated. The DNR supplied extensive comments on the draft document to encourage incorporation of accurate information based on our experience in regulating mining in Minnesota. Few substantive changes were made in the final report. Consequently, although

the report contains some useful background information, it is too narrowly focused on the negative Michigan experience to be relied on as the basis for peat mine regulation.

The Report's recommendation to leave an untouched area of peatland equal in size to the mining area is included among a number of other recommendations. The DNR has found several of the recommendations to be ineffective, unnecessary, and in some cases likely to result in considerable effects. As indicated in the Draft EIS, current research has found a donor area one-tenth the size of the mine area to be sufficient for providing plant material for restoration. The DNR has not found a credible basis for requiring additional "set-aside" acreage.

Item 27

The DNR concurs that the land described as the SE1/4 NE1/4 of Section 27, Township 156N, Range 28W is not included in the current State peat lease. It will be included in a revised lease, which Berger is currently negotiating with the State. As such, it will be covered under the Permit to Mine and subject to the same conditions as the rest of the mine site.

According to the 2000 Koochiching County Land Atlas and Plat Book, the land described as the SE1/4 NW1/4 of Section 26, Township 156N, Range 28W is part of Lot 2, which is included in the current State peat lease.

As indicated in the Draft EIS, there will be limited dewatering effects extending beyond the mine area to approximately 160 feet from the ditch margins, depending on precipitation and the type of peat (fibric versus hemic) present. These effects will occur gradually during mine operation, with water levels restored post-mining. The dewatering could result in subsidence in these areas to the point where the post-drainage water table is reached. These effects have already occurred to some extent where drainage ditches were constructed in the early 1900s. There will be additional limited dewatering where new ditches are constructed (primarily along the southern perimeter of the project). The DNR has found that water levels are drawn down to the greatest extent immediately adjacent the ditch, then rise with distance from the ditch, tapering to near the surface.

The comment recommends that mitigation be required for potentially affected areas beyond the perimeter ditches, that these areas should be added to the leased area, and that they should be included in the Permit to Mine. This recommendation is noted, and will be conveyed to the DNR Division of Lands and Minerals which negotiated the peat lease and will prepare the Permit to Mine for the proposed project.

5.7 WILDLAW

Item 1

The DNR notes the opposition of the Superior Wilderness Action Network to the proposed project, specifically the removal of existing vegetation from 840 acres. This comment will be conveyed to project decision makers for their consideration. The comment does not address information contained in the Draft EIS and does not require further response.

Item 2

The DNR concurs the proposed project will not, by itself, solve Koochiching County's unemployment problems, and concurs there "is no guarantee" that local residents will be hired.

Item 3

The Pine Island Forest Road between the project site and CSAH 30 is approximately 10 miles in length. Annual routine maintenance for forest roads averages $300 per mile. There is no question that the cost of maintaining the road will increase upon the use of the project site. These costs are estimated to be $5000 - $20,000 annually (Koochiching County Highway Department, December 2000) on page 4-95 of the Draft EIS. Circumstances such as prolonged unfavorable weather conditions combined with heavy truck traffic could lead to maintenance costs in the higher end of this range.

Item 4

The DNR concurs peat mining is an extractive activity and that peat is not a "renewable resource" that will regenerate quickly. The DNR concurs that peat bog development is a centuries-long process.

Item 5

The DNR concurs that peatland areas could provide caribou habitat. The proposed project involves mining of less than one tenth of one percent of the peatland habitat in Koochiching County. The DNR does not anticipate the proposed project would diminish caribou reintroduction opportunities.

Item 6

Mercury is currently in the water draining from the bog. As indicated in the EIS, the DNR anticipates additional mercury will be released from the project site during pre-mining drainage and the early stages of mining. Information on potential mercury releases has been collected throughout the EIS development

process, and will be evaluated in greater depth during project permitting. If the project proceeds, the EIS recommends long-term monitoring for mercury release. The EIS is not required to collect all information required for permitting. As stated in the Final Scoping Decision for the EIS, "[t]he EIS will identify all permits and approvals required for this project. While some permit application review may occur concurrently with EIS preparation, the EIS will not necessarily contain all information required for a decision on those permits. No permits have been designated to have all information developed concurrently with the preparation of the EIS nor will any require preparation of a record of decision pursuant to Minnesota Rules part 4410.2100, subpart 6.D."

Although some potential movement of fishes from the drainage ditch to the Black River cannot be ruled out, the life history attributes of the five species found in the ditch (central mudminnow, pearl dace, finescale dace, fathead minnow, and brook stickleback) indicate that they would play a relatively miniscule role in increasing mercury concentrations in subsistence or sport fishes downstream.

The central mudminnow is a secretive species that is most common in small streams ranging from 1-6 meters wide (Becker, G. C. 1983. Fishes of Wisconsin. University of Wisconsin Press, Madison). Because of its secretive habits in association with dense cover and preference for small streams lacking large predators, this species is generally unavailable to large predatory fishes that would be harvested during subsistence or sport fishing. Although nearly ripe females unaccompanied by males have been anecdotally reported to undergo upstream spawning migrations (Abbott, C. C. 1870. Mud-living fishes. American Naturalist 4:385-391), the extent of migrations reported is unknown and may be quite short. No mass migration or segregation of males and females was reported in a life history study of central mudminnows by Peckham and Dineen (Peckham, R. S., and C. F. Dineen. 1957. Ecology of the central mudminnow, *Umbra limi* (Kirtland). American Midland Naturalist 58:222-231). Little movement up and downstream was noted by Peckham and Dineen, except where thick silt covered previous areas of vegetation. Migration consisted mainly of lateral movements in response to floods.

The pearl dace mostly inhabits small streams ranging from 1-6 meters wide (Becker 1983). Its typical habitat is clear, small headwater and bog drainage streams. It is uncommon in medium and larger rivers. It is not known as an important forage species because it mostly occurs in habitats lacking large predators. It is doubtful that there would be significant migrations into large stream reaches where subsistence and sport predatory fishes occur.

The finescale dace is most abundant in small streams 1-6 meters wide (Becker 1983). It is of limited use as a prey species because it inhabits small streams lacking large predators. It is doubtful that significant migrations would occur into downstream reaches where predatory subsistence and sport fishes occur.

The fathead minnow occurs mostly in small streams 1-12 meters wide with few predators (Becker 1983). Thus, their distribution generally does not match well with predators.

The brook stickleback is distributed particularly in small headwater reaches ranging from 1-6 meters wide (Becker 1983). Downstream movements have been reported by Lamsa (Lamsa, A. 1963. Downstream movements of brook sticklebacks, *Eucalia inconstans* (Kirtland), in a small southern Ontario stream. Journal of the Fisheries Research Board of Canada 20:587-589) and Manion (Manion, P. J. 1977. Downstream movement of fish in a tributary of southern Lake Superior. Progressive Fish-Culturist 39:14-16). In both of these cases the streams in which these movements occurred had very high gradients, and the migrations may have been passive movement in high velocity current during high flow. The ditch draining the Pine Island Bog into the Black River has a relatively low gradient, and thus, passive downstream movements of brook sticklebacks may not be significant in this system. Lack of upstream movements indicates that brook sticklebacks do not typically undergo large active migrations. Because of the stiff spines on their backs, brook sticklebacks are not a preferred prey species, and thus would probably not contribute substantially to mercury contamination of predatory subsistence and sport fishes.

In summary, all of these species are most abundant in small headwater streams where few if any predators exist. One would expect these small fishes to have relatively small home ranges and that they would typically not stray downstream from their preferred headwater habitats. Thus, it is doubtful that these species would migrate downstream from the ditch to the Black River on a consistent basis or in any abundance, and therefore will not be significant sources of mercury for predatory subsistence or sport fishes downstream. Although fathead minnows may occupy slightly larger streams, they are rare in the ditch, and thus would not be a significant source of mercury from upstream. It would be expected that the abundance of any randomly moving fishes from the headwaters would decrease exponentially as distance from the headwaters increases.

Regarding concerns about tribal subsistence fishing in the Black River downstream from the bog: EIS consultants contacted the Red Lake Department of Natural Resources about this concern during a phone conversation on 13 January 2001. The Band representative stated that there was not much concern about subsistence fishing because there is probably very little occurring on the Black River. He said that there

may be a concern about hunting and trapping in the area because tribal people eat what they trap. The representative stated that he was acquiring information from subsistence users concerning the amount of subsistence fishing and hunting for an article in a quarterly newsletter last spring.

The DNR notes the EIS does not "sign off" on the project as implied in the comment. The EIS provides information on impacts, commensurate in detail with the expected magnitude of the impact, and suggests mitigation where warranted. The DNR will be a permitting agency if the project proceeds, and must issue permits as identified in the Draft EIS. The Minnesota Pollution Control Agency will make the final determination on mercury limitations and mitigation. Through this EIS, the DNR will convey these comments to the MPCA for consideration in permitting.

Item 7

The Draft EIS statement that "the Black River currently has mercury-related fish consumption advisory" is not correct. The Black River is not listed in the Minnesota Fish Consumption Advisory (2000). However, as shown in Section 3.0, Table 3-3, it is likely that predatory fish, such as walleye, in the Black River currently contain sufficient mercury to warrant a consumption advisory. As indicated in Section 3.0, Table 3-3, the additional mercury released from the Pine Island Bog during drainage will increase the concentration in Black River walleye by < 8%.

Item 8

As to other water quality parameters, existing background concentrations of aluminum in the Black River already exceed the state standard. Dissolved organic carbon, phosphorus and orthophosphorus do not have standards at this time. Existing levels of turbidity in the Pine Island Bog drainage are higher than the state standard. The discussion of water quality effects in the Draft EIS is based on higher discharge from additional drainage ditches. See pages 4-34 to 4-35 of the Draft EIS.

Item 9

As prescribed in the Final Scoping Decision, the EIS describes a number of alternatives (site, scale, technological, etc.) that were considered but excluded from further analysis. As required by rule, the EIS discusses the alternatives and the reasons for their elimination. The alternative of "no action" is addressed in the EIS.

The comment correctly notes that an alternative where the mining of the entire 840 acres is contingent upon the company demonstrating a successful mining of a smaller portion of the project area was not proposed in EIS scoping or considered in the EIS.

Item 10

The comment correctly identifies the boreal owl as a species known to occur in Koochiching County. The boreal owl does live in spruce forests, but it was not reported in the nearby Red Lake Bog by Niemi and Hanowski in *The Patterned Peatlands of Minnesota* (1992). The DNR concurs that black spruce on the project site will not regenerate in the foreseeable future, and will consider the loss of this forest acreage in determining whether to permit the proposed project.

Item 11

The vegetation cover is not removed from the donor site as it is from the mined area, and the donor site will not require the restoration treatment. Only the top four inches of vegetation is removed from portions of the donor site, allowing the donor site to revegetate without intervention within three to five years.

Item 12

Responsible Governmental Units (RGUs) are constrained by the timeframes provided in Minnesota Rule. EIS Scoping ended in late summer of 2000, and EIS preparation began after the Preparation Notice was issued in October 2000. Two hundred eighty days are allotted for EIS completion after issuance of the EIS Preparation Notice (October 2, 2000). The bulk of data collection and analysis had to be completed during the winter months. After meeting with the MPCA during the Draft EIS public comment period, the DNR determined that additional sampling for mercury, and methylmercury specifically, should be completed and extended the EIS completion timeframe with the permission of the project proposer, which is required by rule (the EIS was originally due to be completed in July 2001). On the MPCA's recommendation, the DNR contracted with Dr. Edward Nater at the University of Minnesota to complete additional mercury sampling and analysis. The MPCA had worked extensively with Dr. Nater on other peat/mercury projects. The earliest date for which mercury sampling at the remote project site could be arranged was mid-September, 2001. The Final EIS includes the data from this work.

The Pine Island Bog is a typical example of a rainwater-fed (ombrotrophic) raised bog. Consistent with the scoping decision, the Draft EIS describes vegetation in the project area (see Draft EIS section 4.2.1.2). The description is based on aerial photos, reconnaissance reports and descriptions of similar raised bogs in the area. A biological survey was not completed, nor was one ordered during EIS scoping.

Item 13

According to the mining plan, 4 areas (phases) are to be mined in sequence, and each area will be prepared by installing perimeter ditches that connect to the northern outlet from the bog. To the extent that these areas extend into the Sturgeon River watershed, some drainage will be diverted to the north, resulting in slightly less flow to the south (page 4-14 of the Draft EIS).

The commenter is referred to Section 5.3, Item 3 for additional discussion of effects to the Sturgeon River drainage.

Item 14

The "company", Berger Horticultural Products Ltd, did not prepare any part of the Draft EIS. The DNR bears full responsibility for the information. The DNR concurs that the proposed project site has not been "exploited beyond recognition" by past development activities. The DNR concurs that the proposed project will completely alter the surface appearance of the bog during project life and well into the foreseeable future. The company will not be able to replicate the pre-mining environment. Generally, the goal of reclamation is to create stable, post-mining conditions favoring redevelopment of the pre-mining condition.

The DNR notes the document under discussion is a state-level Draft and Final Environmental Impact Statement, not an 'EA' which is a federal document prepared pursuant to the National Environmental Policy Act.

The question of wetland losses statewide over the last twenty years goes substantially beyond the scope of this EIS. While Minnesota has lost over half its pre-settlement wetlands to drainage, the majority of the loss has occurred in northwestern, western, and southwestern Minnesota in furtherance of agricultural development.

Despite past drainage efforts, Koochiching County retains substantially all its pre-settlement wetland acreage. The County has nearly a million acres of Type 8 Wetlands (bog-type wetlands), over 1.3 million total wetland acres, and just 647,000 acres of upland in a total area of approximately 2 million acres. These statistics do not, however, minimize the importance of no-net-loss of wetlands, which is State policy. The Wetland Conservation Act delegates mitigation/replacement of wetlands altered during peat mining to reclamation implemented under the Permit to Mine Peat. The wetlands affected by mining will be replaced on-site after mining ceases.

Item 15

When no data are available for a site, the assessment process must utilize data from other sites, as the EIS process outlined in Minnesota Rule does not allow time or money to collect extensive new data. Based on the data available professional judgments must be made. Flow estimates made on an annual average basis are not likely to match flow measurements at any one point in time. Possible reasons for the observed higher than average flows were stated. Water table elevation and water discharges will vary over time based on size and frequency of precipitation events and other factors. Impacts are frequently discussed using ranges of effects since no one set of circumstances exists all the time.

As to settling basins ability to reduce turbidity, that is a primary purpose of a settling basin. Turbidity is primarily a function of suspended particles. The settling basin allows suspended particles to settle out.

Item 16

Regarding the paragraph about "all the DNR studies", as indicated in the EIS, the Minnesota Peat Program was initiated in 1975 in response to a growing interest in using peat as a substitute for natural gas. The DNR has relied heavily on the studies and reports generated by the program in preparing this EIS.

In July of 1975, the Minnesota Gas Company (Minnegasco) applied to the Minnesota Department of Natural Resources for a twenty-five year lease to remove peat from approximately 200,000 acres of state-owned lands in northern Minnesota, in close proximity to, and in some cases surrounding, Red Lake Reservation lands. Because of the potential for this large-scale peat extraction to directly affect tribal lands, the DNR contracted for the study, completed in 1978, by the Walter Butler Company. The study goals were to:

1) Assemble site-specific base-line data about the peat resource in the Red Lake area;

2) identify and elaborate upon the key environmental, social and economic issues of peat utilization affecting the Red Lake Indian Reservation;

3) conduct a preliminary review of the possible impact of peat utilization on reservation resources, enterprises and lifestyle;

4) disseminate the information generated by the study to the Red Lake Reservation residents; and,

5) inventory the attitudes and opinions of Reservation residents toward peat utilization.

The study concluded that the proposed large-scale extractive peat use would likely have severe environmental and social consequences in the Red Lake area. DNR's review of the Walter Butler report did not identify a conclusion that "large-scale peat extraction could release harmful chemicals and poisons", as cited in this comment. As might be expected, the report predicted the large-scale peatland drainage would release large amounts of water in Red Lake, generally with low pH, high suspended solids (peat particles), and low mineral and nutrient contents.

While the report supplies useful background information, the scale of peat mining (and proximity to Reservation lands) proposed at that time limits the usefulness of a direct comparison with the proposed 840-acre project.

Item 17

The Draft EIS is an informational document for decision makers to use in determining whether to approve a project and what site-specific conditions or mitigation should be imposed.

Item 18

The review of peatland plants and the effects of peat extraction included in the Draft EIS are based on modern reviews that incorporate information from a wide range of sources, especially the Patterned Peatlands book and recent reviews and research on peatland restoration. A complete review of all the extant literature is outside the scope of the EIS when up-to-date reviews have already been done by other reliable investigators.

Item 19

The comment alleges serious health effects will result from the proposed project. The DNR has found no evidence to support this allegation. The comment contends the proposed project suffers from serious flaws, and will remain flawed until health effects are addressed and an economic analysis is completed that assesses the statewide costs of mercury reduction and additional mercury reduction costs to the state resulting from the project. A statewide analysis of mercury reduction costs to the state is beyond the scope of the EIS. The project proposer will bear the cost of any mercury mitigation measures that are imposed on the project through permitting.

5.8 MS. BETTY PARKER

Item 1

The DNR has not confirmed whether the proposed project lies within a "Military Operations Area", but is not aware of any project aspects that would interfere with military operations.

Item 2

The DNR concurs that sedimentation likely already enters the Black River via existing drainage ditches. Given the small percentage of the River's watershed contributed by the proposed project site, the DNR does not expect the project's sedimentation basins to reduce overall sedimentation.

5.9 MR. DAN WILM

Item 1

This comment asserts that the proposal affects a huge portion of state lands in Koochiching County, and that negative impacts of the project will accrue to the general citizenry. In response, the proposed project will affect somewhat less than 1,300 acres, (all State land), located within the Pine Island State Forest. The total land area of Koochiching County is 2,032,700 acres, including 1,493,514 acres of public land, of which the majority (1,092,761 acres) is State land. The total peatland acreage in the state is estimated at about 6 million acres, with approximately a million acres of peatland in Koochiching County.

The comment requests a statewide analysis of project costs, benefits, and impacts. The DNR believes, however, that the positive and negative effects of the project will be fairly limited geographically, and has included commensurate analysis in the EIS.

Although the DNR concurs unspoiled, quiet lands provide intangible benefits, the DNR has no evidence that this relatively small project has the potential to adversely affect the general public. In setting state policy and spending priorities, the Legislature determined it was in the interest of the state to provide some subsidy ($500,000 for improvements to the Pine Island Forest Road) for peat development in Koochiching County.

During the late 1970s and early 1980s, the DNR completed an extensive evaluation of the state's peatland resources and recommended permanent protection of those areas with unique or significant ecological resources. These areas have since been designated Scientific and Natural Areas by the state legislature and are protected from development. These areas, as well as the newly-designated Big Bog State Recreation Area, are available to the general public for experiencing solitude, scientific study, and low-impact recreation in peatland areas. Six of the Peatland Scientific and Natural Areas are located in Koochiching County.

Regarding the assertion that employment effects are "speculative", the EIS uses available information from similar operations and provided by the project proposer. The DNR concurs that the potential for a pallet production facility is speculative. This type of "spin-off" development is provided as an example of potential related economic activity. Should such a proposal come forward, its potential impacts would be subject to appropriate environmental review at that time.

This information, regarding the relative magnitude of the project, will be conveyed to project decision makers for use in deciding whether the project should be permitted.

Item 2

This comment correctly notes that a biological survey of the area was not completed. The commenter is referred to the response to the Red Lake Band of Chippewa comments, Section 5.6, Item 22, for a discussion of biological resources.

Items 3 & 4

Regarding the loss of timberland and use of gravel resources, as indicated in the Draft EIS, the proposed road improvements would require approximately 70,000 to 80,000 cubic yards of gravel and fill material. The comment correctly identifies the primary location for fill material as a 10-acre parcel located in the SE ¼ of the NW ¼, of the SE ¼ of Section 32, Township 156, Range 27. The comment correctly notes that the proposed fill borrow site, which is proposed for use as wetland mitigation, would not be available for timber production. The comment correctly notes the location of the primary source of the gravel material as the 38.4 acre state-owned site in Section 23 of Township 155N, Range 25W. As indicated in the Draft EIS, the majority of the proposed gravel source has been recently logged and replanted with seedlings. Whether this site is reclaimed and replanted to timber production is a resource management decision left to the DNR Division of Forestry.

At present, state policy does not require mitigation for conversion of timber producing lands to other uses.

Item 5

This comment speculates as to whether Koochiching County may eventually pave the Pine Island Forest Road, and questions where additional aggregate would come from if necessary for paving. This issue is beyond the scope of this EIS.

Item 6

The Permit to Mine requires financial security for peat mining operations. Monitoring also will be a condition of the Permit to Mine. It is not the intent of the DNR that reclamation costs will be borne by the citizens of Minnesota.

Item 7

As indicated in the Draft EIS, ditched drainage water from the bog currently flows both north and south. The bog crests laterally, and it is assumed that precipitation-derived groundwater also flows both north and south from the crest. The DNR is unable to locate the statement that "reclamation could actually be easier in a split watershed". The comment correctly notes that detailed hydrologic flow information is not readily available. However, analysis of topographic maps, aerial photographs, and direct observation of ditch flows allow some conclusions to be reached, as described in the Draft EIS. In response to the comment, however, it is always the goal of mineland reclamation to restore hydrologic flows to their pre-mining conditions to the extent possible. Hydrologic restoration returns flows to their original paths, which generally allows for less long-term maintenance of the site. In the case of the Pine Island Bog, original drainage flows for the bog can be achieved to some degree by ditch blocking and contouring. However, since the existing crest will ultimately be lowered, near-surface flows from the existing crest will not be possible to restore completely. The DNR does not expect deep ground water flows will be disrupted by the mining operation.

The DNR concludes this comment letter is generally in opposition to the proposed project. In response, the EIS does not evaluate whether a project should be permitted or make decisions regarding project merit. It assesses available information on project impacts and recommends mitigation where warranted, for the eventual use of project decision makers. This letter will be conveyed, via the Final EIS for use in permitting decisions.

6.0 ADDITIONAL REFERENCES

Crawford, R.L., 1978, Effects of peat utilization on water quality in Minnesota: Minnesota Department of Natural Resources, p.18.

Berglund, E.R., 1985. Hydrologic and water quality monitoring of a fuel peat mine near Cotton, Minnesota: Minnesota Department of Natural Resources, Division of Minerals.

Minnesota Department of Natural Resources. 2001. Personal Communication from Mark Briggs.

Minnesota Pollution Control Agency. 2001. Personal Communication from Patti King.

Nater, E., 2001, Mercury in the Pine Island Bog (Draft). Report to MNDNR, Division of Minerals, St. Paul, Minnesota.

Natural Resources Research Institute, 2001. Pine Island Bog Horticultural Peat Development: Hydrologic Information for MPCA.

Appendix A

Agency / Public Comment Letters

Responses provided in Section 5.1.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Twin Cities Field Office
4101 East 80th Street
Bloomington, Minnesota 55425-1665

AUG 2 2 2001

Rebecca Wooden, Environmental Planner
Minnesota Department of Natural Resources
500 Lafayette Road
St. Paul, MN 55155

Dear Ms. Wooden;

We received your Draft Environmental Impact Statement (EIS) for the proposed peat mine and associated processing facilities within Pine Island State Forest, in Koochiching County, Minnesota. We offer the following comments for consideration when finalizing the document.

1. We agree that the federally listed threatened and endangered species occurring in the project area (gray wolves and lynx) are not likely to be affected by the project, as proposed. **Item 1**

2. The EIS describes a mandatory bond requirement (page 310) to insure that funds will be available for peatland restoration should the applicant be unable to complete restorations activities. We believe this requirement is necessary to insure harvested peatlands are restored should the applicant be unable to finish restoration. **Item 2**

We understand that the actual negotiation of the bond amount is a permitting issue. However, the consequences of what could occur to the impacted wetlands if restoration is not undertaken is an environmental issue and should be addressed in the body of the EIS with the other descriptions of mitigation. **Item 3**

We appreciate the opportunity to comment on the Draft EIS. Please contact our project biologist, Laurie Fairchild, at (612) 725-3548, ext. 214, if you have questions regarding our comments.

Sincerely,

Russell D. Peterson
Field Supervisor

AUG 23

Responses provided in Section 5.2.

SF-00006-05(4/86)

DEPARTMENT: POLLUTION CONTROL AGENCY

STATE OF MINNESOTA

Office Memorandum

DATE: September 18, 2001

TO: Rebecca Wooden, Environmental Planner, Department of Natural Resources

FROM: Kevin Molloy, Operations and Planning/Environmental Review, North District, MPCA

CC: (MPCA staff:) Ed Swain; Gary Kimball; Roger Nelson; Tom Estabrooks; Robert Beresford; Beth Lockwood; Carri Lohse-Hanson; Bill Priebe; Jeff Jeremiason; Jeff Stollenwerk

PHONE: (651) 296-7376

SUBJECT: Draft Environmental Impact Statement for Pine Island Bog Horticultural Peat Development

Thank you for the opportunity to comment on the Draft Environmental Impact Statement (DEIS) for the project referenced above. Minnesota Pollution Control Agency (MPCA) staff has reviewed the document and offers the following comments for your consideration and incorporation into the final EIS. These comments are supplemental to those already provided up to this point on the proposed project.

Air Quality Issues (MPCA Contact: Robert Beresford, (218) 723-4664)

Item 1

The DEIS notes that milled peat mining can affect air quality adversely (page 4-78), then states that since this particular proposal is not anticipated to be problematic in this regard, no mitigation is required (page 4-79). Since the project's specific operational equipment and procedures have not been identified, it seems a little too definitive to state that "no mitigation is required." The DEIS recognizes that certain air quality mitigative methods are available (e.g., use of enclosed vacuum machines to minimize fugitive dust, reducing fugitive dust by covering stockpiles, not mining on windy days, and using covered trucks/trailers to haul peat); however, without knowing whether the company intends to use these, we are unable to confirm that no mitigation will be necessary.

While no specific air facility emissions permit is required for the proposal, the project must be operated in compliance with the applicable air quality rule, Minn. R. 7011.0150 (Preventing particulate matter from becoming Airborne). This states, in part, that no person shall cause or permit the handling, use, transporting, or storage of any material in a manner which may allow avoidable amounts of particulate matter to become airborne. We suggest that the text be revised to discuss how, if necessary, the appropriate level of mitigation will be employed to ensure compliance with the rule so that the project will not affect air quality adversely. The use of emission control equipped vacuum harvesters for this project (with adequate filters) will be considered sufficient to comply with the requirement of this rule to control avoidable amounts of particulate matter.

Item 2

Also, the statement (on page 4-78) regarding how "fugitive dust is minimized when enclosed vacuum machines are used," in our estimation, would only be accurate if an effective filtration system, installed on each harvester, filters the air before it discharges. To the best of our knowledge, this method has not yet been employed at any Minnesota peat harvest operation; however, this technology has been used in eastern Canada, and is used at a facility in Quebec owned by Berger, the proposed project developer. The unfiltered vacuum harvesters, on the other hand, collect the coarser particles and exhaust the fines upward from their vent stack to the atmosphere. And, the "milling and macerating" process on the field

creates substantial fines, with associated dust potential occurring during the milling process, and later by winds striking the field surface.

With the air-dried, exposed milled peat field, fugitive emissions can also occur under dry conditions and wind speeds over about 10 miles per hour (mph). The peat material is coarser than the taconite basins that have had big dust releases, but is also much lighter and more easily windblown as a result. While everyday emissions may be light, dry conditions and high winds will result in large quantity emissions.

We request that this section of the DEIS be revised to address the air quality impacts discussed above. We understand that each specific mitigative measure the company intends to use may not be known, and that the DEIS does not necessarily have to identify each one; however, we suggest that the DEIS acknowledge that the project will have to be in compliance with the aforementioned air quality rule.

Mercury Issues (MPCA Contact: Ed Swain, (651) 296-7800)

Item 3

While the DEIS includes a few mercury analyses from December, 2000, MPCA staff would have liked to have seen the EIS include additional mercury analyses from a wetter month, and in a manner that would mimic water obtained during dewatering of the peatland for harvesting (the water samples discussed in the DEIS were obtained from existing ditches on the perimeter of the peatland, and therefore did not sample the water currently in the peatland that the project would export). Should there be an opportunity to include additional analyses during the EIS process, MPCA staff can provide some assistance in terms of what methodologies might be useful to employ for this purpose.

Item 4

Work elsewhere, in particular by Dr. Ed Nater of the University of Minnesota, has shown that both total mercury and methyl mercury are significantly higher in the internal waters of a peatland, compared to the water that is normally exported from peatland. It would be useful if the final EIS would identify and apply some of Dr. Nater's work as it would relate to the likely export of total mercury and methyl mercury from dewatering of this peatland.

Item 5

Any new information (comparable data from Nater and field data) on mercury and methyl mercury in water exported from the peatland should be evaluated for the probable impact on receiving waters using as transparent a process as possible, such as a simple mass balance model. We feel that it is not advisable to employ the RMCM model (as was used in this DEIS) or similar sophisticated models for the following reasons: a) The RMCM model and some other models were designed for well-mixed small lakes, and would need extensive modification to be applied to a long, shallow waterway such as a ditch or river; and b) Such models have numerous control points that determine the outcome, and the ability of particular settings to accurately predict the present needs to be verified before the model can be applied to the future. Unless it is possible to test the ability of a model to predict the present, it is not advisable to use it to predict the future.

Item 6

Even if a simple mass balance model is employed to predict the export of mercury, a number of assumptions will necessarily need to be made. In particular, the ability of the settling ponds to remove Total Suspended Solids (TSS) will influence the amount of mercury discharged, in that mercury associates with particulate matter, but also with Dissolved Organic Carbon. The analysis of export conducted in the DEIS should be repeated with any new information on the probable mercury concentration from new samples or Dr. Nater's work on peatlands in Minnesota. The analysis should account for the possibility that particle-settling speed may have been overestimated due to the use of tap water in the analysis (Appendix E). If the tap water, the source of which was not named, had elevated concentrations of calcium, it probably would have accelerated settling speed because dissolved calcium

Item 7

is a good flocculating agent for fine organic matter. The calcium concentration of the tap water used in the experiment should be provided in the final EIS, and compared to the calcium content of water draining the Pine Island peatland.

Also, we suggest that the final EIS state that it is not possible to predict mercury and methyl mercury export with confidence because, other than Dr. Nater's work, there has been little data collected on this question. Methyl mercury is particularly problematical to predict because it can be both produced and degraded after dewatering. Ongoing monitoring of the operation would be invaluable for understanding the impact of such a project. Item 8

The predicted total mercury and methyl mercury concentrations should be compared against ambient receiving water conditions and the state standard of 6.9 ng/L total mercury. In addition, the probable affect of the discharge on the mercury content of fish should be predicted. Rather than using a model that has not been validated, simple ratios could be employed. In other words, one can assume that fish contamination is linearly related to the mercury concentration in the water column. Changes in fish contamination could be calculated for the predicted changes both in total mercury and methyl mercury. If the predicted changes for the two parameters are very different, it reveals the uncertainty in predicting the effect of this discharge. Item 9 Item 10

Wastewater Discharges (MPCA Contact: Gary Kimball (651) 297-8221 and Bill Priebe (651) 296-7150)

Mercury/TSS - It is difficult to determine in the DEIS what post development conditions for mercury (total and methyl) would look like because of the small pre-development data sets, uncertainty of how water would be drained from the peat (i.e. proportions from what depth), and assumptions about treatment of what material is mined and dewatered. Specifically, there is little information on the nature of mercury partitioning with particulates at this site that might serve to help develop TSS effluent limits assuring acceptable mercury releases. The secondary treatment standard of 30 mg/l TSS is part of the normal design conditions, but this level of TSS may or may not control mercury sufficiently. There appears to be unresolved technical issues over the estimate of settling rates for peat particles, mercury partitioning, and detention time that has a direct bearing on treatment design. The MPCA will need more clarification on these issues prior to issuance of an NPDES permit for this proposal. Item 11

Changes in the depth at which bog water is withdrawn – We recommend that the DEIS be revised to describe the depth(s) that the drainage channels will be dug for the actual mining operation. There needs to be a discussion about the depth in the peat that dewatering is going to come from during mining, and in what proportions. How may the mix of these levels change during operation? The DEIS describes current drainage from the different depth levels based on concentrations of certain elements with depth in peat and in bog water (e.g. Table 4-2 and 4-5). This includes pH, mercury, aluminum, and iron. It offers a conclusion that is based on these current bog concentrations and drainage patterns. If the actual drainage from these different peat levels changes during mining, then the discharge characteristics will change accordingly. If possible, the DEIS should be revised to discuss this possibility, with some focus on how the discharge characteristics might change (if the drainage pattern will change). Item 12

Discharge point - Page 4-30 raises the issue of the definition of the National Pollutant Discharge Elimination System (NPDES) discharge point. Typically, a discharge point is the end of a "discreet conveyance" associated with a treatment system that discharges to "waters of the state". There is no treatment system currently, only a "ditch" leaving the bog. It is fair to say at this point that the ditch would be considered waters of the state, and any pipe, weir, or channel connecting the treatment system Item 13

at the point of entry to the "ditch" may be the NPDES discharge point. The Black River is not the immediate receiving water for the discharge.

Natural background for Aluminum and Iron - It would appear from the data on aluminum and iron in the DEIS, and in recently submitted monitoring information, that permit limits based on characterization of "background concentrations" will be needed, as provided in Minn. R., Chapter 7050. Depending on the depth of water withdrawn from the peat that eventually makes up the final effluent, background levels may be higher than effluent limits derived in the conventional manner. Please see our related comment below, under Item d. Item 14

NPDES Permit-related – Prior to issuance of the required NPDES permit for this project, MPCA staff will need additional information, beyond that contained in the DEIS, related to the proposal's anticipated wastewater discharges. These include, but are not limited to, the following:

a) Currently, the project's anticipated design flows and mass are not specifically known. The Minnesota Department of Natural Resources, National Resources Research Institute, and the MPCA have been working on the determination of a discharge water design flow rate for the facility when it is under operation. To date, this rate has not been confirmed. The MPCA will need to be furnished with information related to the facility's peak month design flow with supporting documentation, which reflects precipitation and the impacts from area draw down for the whole site under peak facility operation (when all sites are cleared and being drained). This design flow will be used by the MPCA to develop effluent limits for the discharge of the proposed facility, and will also be used to ensure that the sedimentation basins are adequately sized for the appropriate level of solids to be removed. The MPCA will also need to ensure that the proposal has a viable operation and maintenance plan, prior to issuance of the NPDES permit, so that the sedimentation basin can be relied upon to remove the appropriate level of solids at all times. As previously stated on page 4, "Mercury/TSS", it is unknown, at this time, what the appropriate level of solids reduction will be. Item 15

b) If the discharge exceeds 200,000 gallons per day and increases the mass loading of pollutants to the receiving water, then a nondegradation demonstration is required under the provisions of Minn. R. 7050.0185 (Nondegradation for All Waters). The demonstration would need to evaluate the need for additional treatment beyond the minimal level required by rule. The evaluation would also look at important economic and social development impacts of the project and the impact on water quality. Item 16

c) A new discharge may have a mercury permit limit, depending upon the amount of data collected and an analysis of the potential to exceed water quality standards. Item 17

d) If the background concentrations are determined to exceed water quality standards or criteria for aluminum and iron, then permit limits will be derived based on a calculation of background concentrations. Item 18

e) There is the potential need to submit a variance request if mercury effluent limits cannot be met. As we are unable to rule out the possibility that this may be required, we suggest that the DEIS identify this as a possibility under the Governmental Approvals section. Item 19

f) It was not determined whether the concentrations of cadmium, copper and lead (referred to in 4.2.2.2.1) currently exceed water quality standards. These will, in all likelihood, need to be determined before an NPDES permit can be issued. This is especially true for cadmium since, according to Figure 4-9, an increase in cadmium with depth can be expected and the detection limit was nearly an order of magnitude greater than the standard. The lead detection limit also exceeded the standard.

Item 20

Again, we thank you for the opportunity to comment on this project. The MPCA staff continues to be willing to work with DNR and its consultants on these issues. Should you have any questions or concerns pertinent to this memo please contact me at (651) 296-7376.

KM:sjs

Minnesota Pollution Control Agency December 1996

Peat Operations and Environmental Protection

Peat mining is an important enterprise for Minnesota. The Minnesota Pollution Control Agency (MPCA) works with potential peat operators to share information about water quality planning and environmental protection. The agency and peat operators share many interests and goals in ensuring that our valuable environmental quality is protected. This brief summary reviews water quality concerns, water quality planning considerations, and MPCA permitting for peat excavation activities in Minnesota.

Why Is Peat Mine Drainage a Water Quality Concern?

Poorly managed peat operations can cause water pollution, an important problem that must be addressed. These water quality impacts are mostly due to the intensive land disturbance and water table lowering activities associated with peat extraction. Peat mine drainage can harm Minnesota waters with these pollutants:

Turbidity: Turbidity comes from erosion of the excavation areas and ditches. Cloudy water can eliminate some kinds of fish and other aquatic life, in part by damaging their feeding methods.

Suspended solids: Suspended solids also come from erosion of excavation areas and ditches. Solids can fill in streams, lakes, and wetlands, and destroy the environments on which many fish, waterfowl, plants and other animals depend. They can also deplete dissolved oxygen as they decompose.

Phosphorus: Phosphorus is mostly related to suspended solids, but can also be dissolved. Phosphorus is a nutrient that can stimulate excessive algae growth in lakes and make lakes too polluted for fishing or recreation.

Acidity (low pH): Drainage aerates the peat and releases the acids (often nitric acid and sulfuric acid). Acid waters can kill fish and aquatic life, and limit egg production and hatching, especially during spring snowmelt, when peat field drainage often peaks.

Aluminum: Acid waters in peat drainage help to dissolve aluminum from the peat and carry it downstream. Aluminum can be highly toxic to fish and other aquatic life.

Iron: Acid waters in peat drainage also dissolve iron; iron also can be released when attached to suspended solids. Iron deposits can clog fish gills and deposit harmful scums on stream, lake and wetland bottoms.

Mercury: Mercury can be released during peat drainage. It is very toxic to fish, and accumulates through the food chain.

Ammonia: Peat drainage causes decomposition of much of the soil to release ammonia. Certain forms of ammonia are very toxic to fish and other aquatic life.

Sulfate: Dissolved sulfate is released from peat by aeration and draining. High sulfate levels can prevent wild rice growth.

Other pollutants: Other pollutants, such as different metals and nitrate, may also be generated by peat mining.

Water Quality Planning Considerations

Siting and drainage flexibility are keys to good environmental planning. Some peatlands and downstream waters may be resources of special concern to the state. Early coordination with the MPCA on siting is important in the initial design of these facilities, and can prevent un-anticipated project delays.

Regular, efficient, sediment removal and storage systems are critical for any type of large-scale peat operation design. The MPCA can provide suggestions for the design, operation and maintenance of sediment

removal systems. Effective sediment management is critical to the development of environmentally sound peat operations.

MPCA Water Quality Permit Requirements

A National Pollutant Discharge Elimination System (NPDES) permit is required for surface drainage from a peat operation. This drainage is typically discharged through gravity-flow field and collection ditches to wetlands and/or neighboring ditches.

For smaller peat operations, permit coverage is usually through an NPDES general storm water permit. This permit requires the operator to develop and implement an erosion control pollution prevention plan, and usually does not involve regular water quality monitoring. Larger peat operations, particularly those that would exceed 160 acres, are covered by individual NPDES permits. These individual permits include discharge limits and regular monitoring requirements. Complete permit applications for new or expanded peat operations should be provided to the MPCA at least six months before the new excavation work is planned. The operator thus can help to ensure that the NPDES permit authorization is in effect.

Peat operations that have long-term expansion plans should contact the MPCA before choosing sites. In this way, potential environmental concerns and costs can be addressed upfront, to avoid expensive retrofitting later during expansion. Good early communication with the MPCA in planning peat development can be very valuable in the overall development plans.

Water quality permits include requirements for properly collecting and removing sediments to minimize their impacts on Minnesota's lakes, streams, wetlands and other waters. Larger peat operations need to have an MPCA-approved sedimentation treatment system, typically involving dual, parallel settling basins.

For more information on NPDES permitting, please contact the MPCA at (612)296-7238.

MPCA 401 Certification

The Clean Water Act Section 401 requires that an applicant for a federal permit or license to conduct an activity that may result in a discharge must obtain a certification from the state that the activity will comply with the water quality standards of the state. Typically an Army Corps of Engineers Section 404 permit is required for most peat excavation activities. The certification requires a demonstration that the project impacts have been avoided, minimized and mitigated, as well as compliance with the NPDES permit if one is issued. It is the policy of the state to protect all waters including wetlands from significant degradation, wetland alteration and to maintain existing designated uses. Peat mining alters the wetland. The wetland sequence mitigation principles of avoidance, minimization and compensatory mitigation maintain nondegradation of wetland designated uses. The compensatory mitigation plan or a requirement for a plan to be developed at operational closure is considered during the 401 certification process. If no NPDES permit is required, the certification lists conditions for water quality compliance. For more information on the 401 certification process, please contact the MPCA at (612)297-8219.

MPCA Air Quality Permit Requirements

Facilities must meet the MPCA minimum requirements for dust (Minn. R. 7011.0150 and 7011.0700-0735) and noise control (Minn. R. ch. 7030). Facilities with crushing or screening operations also may have to meet federal standards for emissions of particulate matter from processing equipment. Depending on their capacity and processing equipment, an Air Emission Permit may be required. For more information on air quality concerns and MPCA requirements, please call (218)846-7391.

Responses provided in Section 5.3.

Minnesota Center for Environmental Advocacy

26 E. Exchange Street
Suite 206
St. Paul MN 55101-1667

651 223 5969
651 223 5967 fax
mcea@mncenter.org
www.mncenter.org

September 17, 2001 BY FACSIMILE ONLY

Ms. Rebecca Wooden
Planner Principal
Minnesota Department of Natural Resources
500 Lafayette Road
St. Paul, MN 55155-4010

SEP 25

Re: Pine Island Peat Bog
Berger Peat Mine Draft Environmental Impact Statement

Dear Ms. Wooden:

Thank you for the opportunity to submit comments on the Draft Environmental Impact Statement ("EIS") for the Pine Island Bog Peat Horticultural Development (the "Project"). These comments are submitted on behalf of the Minnesota Center for Environmental Advocacy ("MCEA"). MCEA is a Minnesota non-profit environmental organization whose mission is to use law, science and research to protect Minnesota's wildlife, natural resources and the health of its people. MCEA membership is state-wide.

MCEA is generally concerned about the overall impact to Minnesota's environment from the further fragmentation of important large natural resource areas as represented by the Pine Island Peat Bog. MCEA is not insensitive to economic needs of immediately surrounding communities and understands the desire to improve standards of living in the area. MCEA's comments are intended to help ensure that those needs and how to meet them are fully examined in light of overall societal costs, including costs and potential long-term impacts to our environment. MCEA's comments are intended to assist in the most-informed decision-making in order to avoid after the fact regrets.

Drainage/Split Watershed

Item 1

Discussions in the EIS of drainage issues and the potential impacts to the watershed to the south of the project are inadequate. First, the EIS continuously (in all areas, not just drainage) emphasizes that the Pine Island bog is not "pristine"; that attempts to do some drainage were made in the very early part of the twentieth century; that it is not important from an endangered species or mega-fauna perspective. This seems like justification and not neutral scientific evaluation. Further, simply because an environment has been rendered less than pristine by earlier human activity should not so readily be submitted as justification for further and much more extensive intrusion and damage. This line of reasoning likely means that the Pine Island Peat Bog will forever be in jeopardy from further development. Will a new and more damaging project be justified fifty years from now because the bog was compromised by mining? MCEA requests that the final EIS be amended to remove these kinds of apparent justifications for the Project.

Item 2

Second, the EIS fails to assess to what extent the old drainage ditches are functioning or impacting the natural functions of the bog. Drainage ditches that are as old as these often do not effect much drainage at all due to blockage and sediment accumulated over the years. The draft EIS appears to assume that some drainage is constantly occurring without

actually measuring what is truly happening in those ditches. The actual hydrology as it relates to those old ditches should be examined, not assumed, and should be actively compared/contrasted to the hydrology of the increased drainage expected to occur as a result of the Project.

Item 3

Third, the draft EIS glosses over the issues related to the "split" watershed. The draft EIS acknowledges that the Pine Island Peat Bog appears to be a high point and that the larger bog/mine area drains both to the north and the south with the precise split unidentified. The draft EIS further acknowledges that the drainage to the south from the bog feeds a fen – a wetland type extremely dependent upon groundwater and very sensitive to changes thereto. The fen ultimately drains to the Sturgeon River. The draft EIS says nothing about what potential impacts may arise from cutting off a significant amount of flow from the bog to the south. The draft EIS notes that the groundwater flow in the bog is likely through the surface layers which means that most of the groundwater will be drained in order to mine the surface layers. On page 4-9, the draft EIS states that the old perimeter drainage ditches are *probably* already impacting groundwater. There is no support for this statement (see above comments) and more importantly, the draft EIS fails to acknowledge that there are currently no perimeter drainage ditches, old or otherwise, on the south end of the proposed Project. The draft EIS discloses that all of the perimeter ditches for the Project will route all drained water to the north into the Black River. Moving water from one watershed into another can have profound environmental impacts that are left completely unaddressed in the draft EIS. Figure 4-5 shows the largest impact from dewatering for the Project to be on the south side. This is in direct conflict to the wholly unsupported statement made on page 4-13 of the draft EIS that, because harvesting will mostly be on the north end, there is little chance of impact to the south watershed. MCEA requests that this lack of information on the impacts to the fen and Sturgeon river be disclosed and analyzed in the final EIS.

Item 4

Fragmentation of Habitat/Impacts to Wildlife

As noted above, one concern is the continued fragmentation of habitat in the state. Large undisturbed tracts continue to shrink. Researchers are just beginning to understand the adverse impacts this can have on a variety of species. Because it is not yet well understood, the EIS should address this subject and do so in some detail, perhaps including literature on the topic. The draft EIS addresses it in summary or cursory fashion only. The draft EIS contains no discussion of the intrinsic value of large unbroken habitat (probably because it does not lend itself to a "dollar" valuation).[1] Rather, impacts from habitat fragmentation and to wildlife in particular appear to be minimally addressed because this is not an "important" bog and that all the "important" bogs have been preserved in pieces as scientific and natural areas ("SNA"). That non-scientific statement appears to be made based upon the fact that few attractive mega-fauna or rare/endangered flora are regularly present in the bog making it less valuable.[2] Those are the very judgments that can render things endangered over time. It is the role of the Department of Natural Resources ("DNR") to take a larger view.

The draft EIS also inadequately addresses impacts to songbirds. The draft EIS briefly makes note of the fact that songbirds may be impacted due to the fact that a variety of species nest in the bog or surrounding area. There is little discussion of impacts to those species from this noisy, intensive activity. Habitat destruction is the number one reason for songbird population decline. MCEA requests that the final EIS contain a more in-depth assessment of these impacts.

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[1] See also, correspondence in your file from Environmental Protection Agency regarding value of large wetland..

[2] It is further noted that this bog was long ago the one determined most valuable for peat mine development. The question arises, to what extent was this bog determined not suitable for designation as an SNA due to that very fact.

Water Quality and Mercury

MCEA has reviewed the memorandum from the Minnesota Pollution Control Agency ("MPCA") to DNR dated May 31, 2001. MCEA adopts and reiterates the bulk of MPCA's comments. It appears that certain conclusions were drawn regarding mercury impacts with little supporting data. One monitoring event of present conditions is inadequate for drawing conclusions about what is going to happen when the large area of the Project is drained and mined. As the draft EIS notes, much of the mercury in the Project area is stored in the surface layers of the peat – the layers to be drained and mined. Further, there appears to be no discussion of whether mercury impacts will be heightened due to the fact that the bog may no longer be functioning in a manner which absorbs and possibly stores atmospheric mercury once the Project reaches full capacity. Finally, the draft EIS does not assess whether and to what extent the mercury discharges will be impacted by the fact that water that now drains to the south into the Sturgeon River will be rerouted to the north and the Black River (see above). Is there an attendant increase in mercury? Additional information on mercury impacts should be developed in the final EIS. Item 5

Reclamation

Reclamation is an extremely important issue relative to environmental impacts from this Project. MCEA notes that the draft EIS does include some good information regarding proposed reclamation, but a few specific topics need further assessment. While it is difficult to predict what the exact nature of reclamation may be in the long term, a commitment that reclamation will fully restore all functions and values of the Pine Island Peat Bog and will do so using the most advanced methods available at the time of reclamation is an important commitment missing from the text of the draft EIS or the Project proposer's materials. Item 6

Information is entirely absent regarding financial considerations. While the draft EIS notes that "financial assurance" is required for reclamation, absolutely no detail is given about what may or may not constitute "financial assurance." The final EIS should contain a discussion of those options and what the estimated cost in future dollars may be. This is particularly important in that public, including state, dollars are going into this Project (road funds in particular) to the benefit of a private entity with impacts to a public resource (state forest bog). There is little to no incentive for the private entity to spend much time or money reclaiming a site once the benefits are no longer available. The public – an involuntary investor in the Project – has a right to know in detail at the outset that reclamation is planned and paid for.

The draft EIS notes that earlier comments requested a smaller mined area in order to increase the potential donor area and to decrease impacts from drainage. The draft EIS rejects the earlier suggestions as leaving too small an area to be mined. The final EIS should explore "in-between" options. Further, the final EIS should address potential adverse impacts to the donor area and the possible need for a somewhat larger donor area to ensure those impacts are minimized. Item 7

Socioeconomic Impacts

While socioeconomic impacts are discussed in some detail, some areas are left unaddressed. In particular, this section of the draft EIS seems to only discuss positive economic impacts. Costs are completely ignored. Public costs are not discussed and compared to benefits. Page 4-95 of the draft EIS details significant costs to the Minnesota public from road improvement and upgrades. There is also a natural resource cost to the public in allowing mining on a public forest resource. Reclamation and other environmental costs – sometimes referred to as "externalities" are unaddressed. Again, the public in general is bearing a share of the actual dollar costs of development of the Project and an assessment of the potential of the public to bear even larger costs from environmental damage should be assessed. Item 8

While MCEA is mindful of the possible need and certainly the desire for more economic development in this area, the entire costs, including costs to the environment and public, should be carefully weighed against what might be minimal benefits. As noted in the draft EIS, these are mostly part-time jobs (only five are identified as potential full-time). It appears that the total amounts to be earned in those part-time jobs is approximately $9,000-$10,500 each. It is unlikely part-time jobs include benefits such as medical and dental coverage. The draft EIS notes that these jobs may not be "new" jobs in that they may be held by workers employed the other half of the year by the logging industry. That is important to, and good for, improving the standard of living and MCEA does not overlook that fact, but it may not improve overall unemployment in the region. It appears likely that most of the economic benefit from this Project will in fact flow to the Canadian company Berger Horticultural Products. A more generous investment in the community and these potential workers by the Project proposer may better balance the significant adverse impacts to the environment and the large public investment in the Project. The final EIS should provide analysis of this balance. Item 9

The final EIS should omit some of the more speculative economic assessment such as the "multiplier" effects. These types of assessments tend to inflate benefits with very little support, particularly in a declining economy. It is impossible to predict these types of benefits over the long term. Item 10

Finally, MCEA takes issue with the statement on page 4-54 of the draft EIS which baldly states that no group will suffer a net loss. There is absolutely no support for that statement and it is laden with value judgments inappropriate to an EIS. As noted above, many groups in this state may very well find they have suffered a net loss in helping to pay for a project which further destroys a large unfragmented habitat. This statement appears to ignore the concerns of the Red Lake Band of Chippewa community in particular. Item 11

Conclusion

Again, thank you for the opportunity to comment. It is clear that DNR has put a significant amount of work into the draft EIS and it is MCEA's desire that the final EIS will present a full, complete analysis of all environmental impacts and fully weigh those and other costs against benefits. MCEA looks forward to the publication of the final EIS. Please do not hesitate to contact me should you have any questions.

Sincerely,

Janette K. Brimmer
Staff Attorney

cc: Chuck Meyer, Wetland Specialist
Red Lake Band of Chippewa

Jeff Koschak, Army Corps of Engineers

Minnesota Department of Agriculture

July 27, 2001

Rebecca Wooden, Planner Principal
Minnesota Department of Natural Resources
500 Lafayette Road
St. Paul, MN 55155

Re: Draft Environmental Impact Statement for the Pine Island Bog Peat Horticultural Development

Dear Ms. Wooden:

Thank you for the opportunity to review the Draft Environmental Impact Statement (DEIS) for the Pine Island Bog Peat Horticultural Development. The Minnesota Department of Agriculture has reviewed the DEIS and has no comments on the project.

Item 1

Sincerely,

Becky Balk

Becky Balk, Agricultural Land Use Planner
Agricultural Development Division

JUL 30 2001

• 90 West Plato Boulevard • St. Paul, Minnesota 55107-2094 • (651) 297-2200 • TTY (651) 297-5353/1-800-627-3529 •
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Responses provided in Section 5.5.

UNIVERSITY OF MINNESOTA

Duluth Campus

Center for Applied Research and Technology Development

Natural Resources Research Institute

5013 Miller Trunk Highway
Duluth, Minnesota 55811-1442

218-720-4272
Fax: 218-720-4329

August 31, 2001

Ms. Rebecca Wooden
DNR Environmental Review Section
500 Lafayette Road
St. Paul, MN 55155-4010

Dear Rebecca:

In reviewing my notes from the Pine Island Bog Horticultural Peat Mine public meeting, I came across the following comments expressed by several individuals at the meeting. You may already have these comments, but I just wanted to make sure that they will be addressed in the final EIS for the proposed project.

1) The final EIS should put more emphasis on the positive socioeconomic impacts of the project. Perhaps a higher economic multiplier could be included to give a range of estimated economic impact. **Item 1**

2) The socioeconomic impact section should include data from the newly released 1997 Census where appropriate. **Item 2**

3) The section on mitigation for mercury (page 4-37) should include additional information on how mercury releases, if detected, could be controlled or mitigated. **Item 3**

Thank you.

Sincerely,

Kurt

Kurt Johnson,
Research Fellow

C: Andreas Avenriep
Mike Hanson
Tom Malterer

DATA\WDOCS\JOHNSON\LTRS01\WOODEN83101

Responses provided in Section 5.6.

RED LAKE BAND
of CHIPPEWA INDIANS

Red Lake, MN 56671 Phone 218-679-3341 • Fax 218-679-3378

DIVISION:
Department of Natural Resources

September 14, 2001

Rebecca Wooden
Environmental Planner
500 Lafayette Road, Box 10
St. Paul, MN 55155-4010

Re: Comments on the Draft EIS for the Proposed Pine Island Horticultural Peat Mine

Dear Ms. Wooden,

I would like to make the following comments on the Draft EIS for the Proposed Pine Island Horticultural Peat Mine, on behalf of the Red Lake Band of Chippewa Indians. The Red Lake Band remains opposed to peatland development, as was evidenced in 1976 by Resolution No. 91-76. Although this resolution was more specifically directed to attempts by the Minnesota DNR to access Band lands, the Tribal Council did precisely state its opposition to the potential disturbance or defacement of Band lands. This sentiment was further evidenced in the minutes of a special meeting held on February 10th, 1978, wherein it is stated:

> "The Council's stand and reaction to any attempt by Minnegasco or any other company toward peat development, whether it be for on-site or extractive use, is that we strongly object and oppose any such operations on the grounds that it is our Red Lake Land, our watershed area, our lake, our forest, our game and fish, our fur-bearing animals, our wild rice and we do not want it tampered with in any manner, shape or form."

Item 1

At the regular meeting of the Red Lake Tribal Council held on August 9th, 2000, the Red Lake Tribal Council reaffirmed its' long-held opposition to peat development within watersheds which the Red Lake Nation has land and resource holdings. The Red Lake Tribal Council believes that there is substantial scientific evidence that irreparable environmental damages would result from peat mining that would harm the Reservation environment, Reservation trust resources, and Band members' lives.

The Red Lake Band of Chippewa Indians is very concerned about the potential environmental impacts of the proposed mine (such as the release of methyl-Mercury), that could negatively affect tribal trust resources in downstream areas, especially as related to Band members' subsistence lifestyles. Furthermore, the Band is concerned with the increased accessibility to the area that will be afforded to the general public as a result of this project, which may result in increased trespassing and poaching on tribal trust lands.

Item 2

Item 3

The Band has long recognized the valuable natural functions, such as water purification, that are performed by these sensitive ecosystems. Furthermore, the Red Lake Band is sensitive to the rights and needs of our animal and plant relatives that might be destroyed or displaced due to such peatland development. Moreover, the Band is duly concerned about the potential for disrupting the people's cultural and spiritual ties to this delicately balanced system due to the destructive nature of peat extraction, as well as the potential for irreparable damages to result from the operation that would affect the people's ability to hunt and gather for subsistence purposes.

Item 4

Item 5

We thank you for the opportunity to comment on this draft EIS.

Sincerely,

Chuck Meyer
Wetland Specialist

Enclosure

We offer the following comments in regards to the Draft EIS for the Pine Island Horticultural Peat Mine:

1. **Drainage Scope and Effect –**
   We previously consulted with a number of sources to calculate the scope and effect of the perimeter ditches that are anticipated for the mine. According to our best calculations, the down gradient lateral effect of the ditches is in the vicinity of 325 meters, or 1,066 feet. To add a safety buffer to this figure, we suggested using a distance of 400 meters, for calculation of the lateral effect of the ditches.

   Item 6

   The specific areas to be mined, designated as phases 1 through 4, are under lease from the state. However, the lateral effect of the perimeter ditches, as currently planned, will extend outside of the designated areas, into parcels that are <u>not</u> under the lease. DNR acknowledges this fact, and provides a map of such lands in Figure 4-5 on Page 4-16 of the Draft EIS. Since these acres are not covered under the lease (under which they would be exempt from wetland mitigation due to a mining permit) the mining operation should at least provide mitigation for these acres. Furthermore, while proponents of such mining operations contend that hydrological impacts due to mining are "temporary", this operation is estimated to be in production for over 30 years (at the very least). Therefore the hydrological alterations to surrounding lands will be active for nearly a generation, even if the mine site is promptly and completely restored, which will be a very difficult and lengthy task at best.

   Item 7

   The state DNR, as shown in the Draft EIS, has determined that a lesser number of acres outside of the mine site would be affected by dewatering (than we had determined). Verbiage on Page 4-15 also notes that these areas would be subject to the negative effects of subsidence as well. However, while the map provided in Figure 4-5 clearly shows that there will be some impacts outside the boundaries of the mine, there are no figures presented in the Draft EIS that quantify the actual acreage figures that the DNR anticipates will be ultimately affected. If one were to put aside the argument over how many acres of wetlands would be affected beyond those covered under the permit to mine, it is clear that some significant acreage would be affected. And, since these affected areas are outside of the area described in the permit to mine, there should be mitigation and replacement performed for these additional acres. This should be included in the Draft EIS discussion, however it is not covered.

   Item 8

2. **Subsidence –**
   Subsidence is a common effect of peat mining, resulting from shrinkage, settling, and an increased rate of decomposition of the peat. In turn, subsidence often changes water flow patterns and amounts, and results in increases in peat density that change surface water flows and increase runoff. These changes are often more important in unmined areas affected by the drainage ditches than in the mined areas themselves. Monitoring at the mine site should include subsidence

   Item 9

measurements, and lands adjacent to the mine site affected by subsidence should be mitigated for (see Comment Number 1 above).

3. **Methyl Mercury discharges –**
We are very concerned about the potential for release of methyl mercury in conjunction with mine drainage. The mining operation anticipates the utilization of the northern outlet from the site (across the beach ridge) for waters extracted from the bog. Red Lake owns and has jurisdiction over trust properties located within several hundred feet of the down gradient channel from the outlet. The current mining plan involves ditching and draining the bog, and collecting the extracted water in a settling basin prior to its' release downstream. Item 10

Research performed on impounded waters in Minnesota and Canada indicates that when waters drained from such bog areas are collected and then stand for a period of time exposed to biological activity, one very common result is the methylation of mercury that is naturally present in the sediments and water. Methyl mercury is the most toxic and bioaccumulative form of mercury, and presents a distinct hazard to the environment as well as to any humans who consume foods exposed to it. Furthermore, since the methyl mercury is both bioaccumulative and persistent, it will eventually migrate down gradient to contaminate fishery stock in the Black River and all points downstream, whether due to transmission via the water itself or by biological pathways. In these days when numerous lakes and waters are (and have been) under fish consumption advisories, we consider it very irresponsible to consciously compound the situation by purposely adding to the problem, all the while contaminating more of the fish and game that many Minnesotans typically consume. Item 11

There is some discussion of the methyl Mercury issues in the Draft EIS. However, we question some of the information presented as well as some of the methods used by which the authors to develop their conclusions. For instance, it is clear from existing studies that Mercury accumulation and methylation is a complex process, governed by a number of factors. In Mercury in a Spanish Peat Bog: Archive of Climate Change and Atmospheric Metal Deposition (Martinez-Cortizas, et al, May 1999 Science Magazine), the authors note that cold climates promote enhanced accumulation and preservation of mercury with low thermal stability. It is further noted that when such accumulations are exposed to increased thermal activity, the mercury becomes unstable and more becomes methylated. Mining activities at the Pine Island Bog site are projected to occur during the summer, which represents the period of the year that we undergo higher temperature regimes. Therefore, during the mining process, an increased percentage of the mercury that is currently resident in the bog in a relatively stable form (especially as related to samples collected in December) will be exposed to conversion to methyl-Mercury.

Further discussion of the complex factors that influence Mercury methylization are detailed in The Chemical Cycle and Bioaccumulation of Mercury (Morel, et

al, Annual Review of Ecology and Systematics, Vol 29, 1998). It is interesting to note that the solubility of mercury increases proportionally with sulfide concentrations. However, there are no figures presented in the Draft EIS on sulfide concentrations present in either water or sediment samples collected for the Draft EIS. Attachment I to the Draft EIS, page E-13 does list several items for chemical inputs into the RMCM model for sulfates, however we cannot be certain that the figures used are comparable for the Pine Island location, as apparently no sulfate samples were collected from the site. This information should be presented for adequate review.

The water samples taken by BSU for the EIS were collected on October 31, 2000. Mercury sampling was conducted by NTS on December 13, 2000. Furthermore, the information collected from these samples has been extrapolated by BSU to be relevant during the range of conditions that occur during the year at the site. It is important to note that both the water samples and the mercury samples were obviously taken during a period of low thermal conditions, as well as typically the lowest flow conditions for the year. Furthermore, all of BSU's assumptions about flows, TS, TSS, and mercury discharge are based totally upon this one sampling event, which is not comparable to either the average norms for the area, or conditions (and time of year) that should be present during the proposed mining activities. As a simple example, flows for the Black River, for the month of October 2000 were recorded at an average of 6.54 cfs as noted in Table E-1 on Page E-6, and are significantly lower than the gross average monthly flows (31.85 cfs), and also significantly lower than the high flows recorded in May at 44.87 cfs. We therefore question the validity of the samples taken, and especially the application of the flow and other data into the models by which BSU developed its' estimates of TS, TSS, outflow, and Mercury discharge.

Item 12

The article Recent Declines in Atmospheric Mercury Deposition in the Upper Midwest, (Engstrom and Swain, in Environmental Science and Technology, Volume 31 No.4, 1997) notes that mercury deposition rates have declined in recent years. However, they also provide Hg accumulation rates measured for a number of typical lakes in the northern Minnesota vicinity. Rates cited range from a low of about 20-$\mu g/m^2/yr$ to approximately 70-$\mu g/m^2/yr$. These appear to be significantly higher than the figures utilized by BSU in their RMCM simulations. Attachment I to the Draft EIS, page E-12 provides the inputs for the simulation model, and cites a figure of 10.08-$\mu g/m^3$ for both Mercury and Methyl Mercury deposition. These figures appear to be lower than those found in other studies for the area, and we find the use of the units $\mu g/m^3$ to be inconsistent and confusing. Additionally and more troubling, the table refers to a default figure, in $\mu g/m^2/yr$, which is not actually quantified anywhere in the Draft EIS. We therefore question whether the data used by BSU is valid for the study area, because we cannot find any numbers to associate with this default value. Likewise, we cannot find deposition figures presented in the Draft EIS that are comparable with other existing research.

Item 13

Item 14

Ultimately, should this mine become a reality, ongoing monitoring for methyl mercury in the mine's impounded and discharge waters should be required. Furthermore, mercury discharges from the mine should be very heavily monitored during the initial stages of mining at any given unit in order to fully and adequately capture the heaviest and most volatile potential releases that would be anticipated to come from the upper surfaces of the peat. There is no timetable or sampling schedule presented in the Draft EIS to accommodate this. Item 15

Obviously, discharges of waters from the site should be timed such that methyl mercury is released only at the safest levels possible. Moreover, there should be some provision such that if methyl mercury levels exceed EPA's currently acceptable levels, any further releases of water from the mine should be prevented and mining activity ceased until the situation can be remedied. Item 16

Curiously, the currently proposed system of ditches and settling basins incorporates the use of "adjustable" cofferdams with v-notch weirs. We suggest that the plans for these structures be reviewed prior to any permitting action so that there is some provision made to ensure that, if necessary, all water outflows can be shut off. If the proposed system is not capable of being completely shut down, we recommend that it be replaced with a system of water controls that will allow water flows to be completely shut down. Item 17

4. **Low oxygen (anoxic) discharges to downstream areas (and Black River) –** Since the mine proposes to store waters for some time prior to their release, there is a potential for the release of anoxic waters, especially if releases are conducted in the late winter and/or early spring. Although there appears to be adequate potential for natural treatment of these anoxic waters prior to their entrance into the Black River, there is still the matter of the alteration of portions of the down gradient environments that are subjected to (even) the (temporary) influence of anoxic waters. Exposure to anoxic waters will alter the resident vegetation and the utilization of these areas by animals, including macro invertebrates, and therefore these areas should be counted when considering the potential impacts of the operation, and mitigated for appropriately. Alternatively, the mining plan should include some mechanism that will be put in place to accommodate sufficient oxygenation of any water prior to its' release from the mine site. Accordingly, all discharge waters should be monitored for dissolved oxygen prior to any releases. Item 18

5. **Low pH discharges to downstream areas –** Waters found in bog ecosystems typically have very low pH values. Drying of the peat leads to accelerated decomposition, and mineralization which results in the release of hydrogen ions that may cause the pH to fall to toxic levels even to bog species. A side effect of the mineralization process is the release of nutrients such as nitrogen (nitrate and/or ammonia), phosphorus, potassium, and calcium. Research has shown increases of ten- to one hundred-fold in these nutrients in a milled peat field as compared to undisturbed bog waters. Item 19

Waters extracted from the bog through drainage activities to accommodate peat mining are expected to have pH values at levels that are below typically accepted levels for discharge waters. The current mining plan assumes that routing the discharge waters through mineral uplands will sufficiently buffer the pH to attain acceptable levels. We maintain that all waters from the mine should be adequately monitored and pH buffered as necessary, prior to any release from the mine site. Furthermore, discharge waters should be monitored for the nutrients mentioned, and mine water should not be discharged if levels are above the regulatory limits.

Item 20

6. **Increased use of area for snowmobiles/ATV's, especially in future –**
There are several roads that are being upgraded in conjunction with the development of the Pine Island Bog Mine site. The proposers of the mine maintain that the site will be closed to recreational vehicle use for its lifespan of 30-50 years. However, the proposed upgrading of roads into the mine site will also provide increased accessibility for recreational vehicles and activities to the surrounding area. Red Lake lands in the vicinity of the project site are within relatively close distances of the mine site, and the access roads. Over the past number of years we have seen increased trespassing on tribal lands, as well as poaching. We believe we are well within reason to anticipate that even prior to the opening of the mine we will be experiencing increased trespass and poaching on our Pine Island parcels. Once the mine is actually closed, these occurrences will probably mushroom. This will result in considerable costs to the Red Lake Nation to monitor, apprehend and prosecute perpetrators of Red Lake's trespass laws.

Item 21

Furthermore, the mine's proponents have neglected to mention that Milled-peat mining, which is very weather dependant and can only be accomplished during the growing season, only allows about 100 days of mining per year. The County and the mining contractor should be required to ensure that during the winter months, when the operation is at a standstill, there will be adequate staff housed at the site to monitor and prevent unauthorized use of recreational equipment. Furthermore, they should be held liable in the event that the increased access to the general area proves to create any immediate increase in trespass on surrounding lands.

7. **Lack of adequate Biological Survey to identify any rare, threatened, or endangered species of plants and animals resident at the site –**
There has not been any County Biological Survey work done for the Pine Island Bog Site in order to identify rare, threatened, or endangered species of plants and animals that might be resident at the site. Such survey work should be accomplished prior to any work being accomplished at the site, and presented in the Draft EIS. At the end of the mining process, the operation will be expected to reclaim the site by restoring it to its' pre-mining state (or, in reality, as closely as possible). Although current COE rhetoric seeks to restore acres of wetlands for acres impacted, the true focus of restoration is to replace the functions and values of the wetlands that are lost due to an impact. This means that to truly accomplish proper restoration, one must know up front what is to be impacted, and have some

Item 22

sense of what could potentially be lost altogether. While the Draft EIS does present a restoration plan to re-establish the bog's vegetative community, we assert that there is a significant difference between a mined-out cell that has a floating mat of sphagnum at its surface and the fully-functioning bog ecosystem that once was located in its place.

In the absence of proper biological surveys to identify the plants and animals that are resident in the area, as well as surveys to adequately assess what wetland functions and values are provided by the system (and some basic quantification of those functions), there can be no hope for true restoration at all. This information is critical to develop and define what the eventual target of restoration should be. Furthermore, it should be accomplished on all lands bordering the parcels to be mined, so that we can properly ascertain whether (or not) these areas remain intact throughout the mining process. Moreover, as this project is being accomplished on public lands, thereby with public backing, this information should have been included as background information in the Draft EIS. However, despite the fact that bogs are known to be low-pH environments that typically harbor a number of rare or endangered species of plants and animals, the DNR has not collected any actual biological data from the site of the proposed mine. Information presented in the Draft EIS has been assembled not from any actual on-site activities, but rather from archival data extrapolated from other "typical" sites in the greater vicinity. We believe it is essential that actual biological data be collected from the proposed mine site and presented in the EIS for an adequate review of the mine's potential impacts.

8. **Reclamation –**

Item 23

Since the proposed mine is exempt from Minnesota's Wetland Conservation Act as it will be under a Permit to Mine, the mine's promoters and the Minnesota DNR consider the operation not to be subject to mitigation requirements. Accordingly, the 840 acres of raised bog habitat are proposed to be mined without any considerations of replacement for the functions and values that the raised bog provides to the surrounding environment. As evidenced in the Draft EIS the mine's proponents actually assume to impact not only the 840 acres within the mining permit, but additional acreages of surrounding lands that would be affected by the mining activities.

The reclamation plan provided in the draft EIS, page C-1, states, "...restoration would be initiated for individual mined peat fields as they are depleted of horticultural quality peat." Accordingly, under the conditions of the Permit to Mine, the mined area will be required to be restored only after all mining within a particular unit ceases. However, there are no stipulations whereby the operation is ever required to actually declare that activities within any given mining unit are actually completed, which is the trigger for the reclamation effort. As long as the operation leaves a minute amount of product in the unit, it can declare that it will revisit the site to finish at a later date. Therefore, the operation can go on for any amount of time, without any restoration requirement, and perhaps, until anyone

forgets that restoration should be required. Permits should include a time requirement or deadline, such that after the given amount of time, even if the entire product is not extracted, production at the unit is declared completed, and restoration is to be initiated.

Item 24

There would appear to be several options to restore the mined areas after six feet of peat are extracted from the bog. One choice would be to restore the area's hydrology to pre-project conditions (thereby restoring hydrology to surrounding lands). Under this scenario, however, what was once the core of the raised bog would become simply a six-foot hole filled with water. This open-water system would not be an adequate or acceptable replacement of the functions and values provided by the original raised bog system. A second choice could involve some means of diking off the mined areas from the surrounding lands, such that a new bog habitat could be created at the bottom of the six-foot hole left by the extraction process. This would provide in-kind restoration for what was lost, however, since the groundwater discharge that was once provided from the core area to the surrounding lands would be lost, the additional acreages of affected wetlands outside of the mining units would never be restored.

Item 25

Additionally, under the Permit to Mine's reclamation policy, there is no requirement for ongoing monitoring of the restoration attempt or any means of determining whether the functions and values provided by the original bog are actually being replaced. Accordingly, the Restoration Plan provided as Appendix C to the Draft EIS indicates that the monitoring and maintenance would continue until the 75% cover standard was attained. However there is no measurement of function and value, nor any mechanism to ensure that the "restored" area ever provides comparable functions and values to those lost to the mining process. Similarly there are no mechanisms provided in the Draft EIS to even ascertain what exists on the site prior to mining, or what functions and values might be impacted or lost through, or subsequent to, the mining activity. Therefore, there are no assurances that the restoration will ever come close to resembling the original site's characteristics. Furthermore, with no adequate continuing monitoring in place, there is no mechanism to combat the possibility of invasive species taking over the site. Studies performed by COE staff have identified the necessity for monitoring well into the future at restoration sites. These same studies have indicated that it can often be eight to ten years after inception of the restoration that invasive species will attempt to colonize a site. Left unchecked, these species can quickly take over and convert a restoration site to an essentially sterile environment as compared to its former conditions. Monitoring should be required at least until the restoration is determined to be successful. Furthermore, both operation and restoration plans should have feedback mechanisms that ensure that these efforts can, and will, be modified based upon the monitoring results.

Furthermore, as suggested in the EPA's 1998 publication *Development of Criteria for the Review of Peat Extraction Proposals in Michigan and Other Region V*

States, there should be an area of peatland on the applicant's property equal to the area to be mined that is set aside untouched as a restoration reserve. This reserve should have the same vegetation as the area to be mined, in order to serve as a source of plants and/or propagules for the restoration effort. Accordingly, the County should secure an additional lease for this amount of land, surrounding the mine site, from the State. Item 26

9. **Lack of mitigation for affected lands not covered by the mining permit –** As noted above in Comment Number 1, there has been no mitigation or replacement proposed for the additional acreages of land that would be negatively affected by the mine drainage activities which lie outside of the area designated in the lease with the State. In addition, two quarter sections of land, the SE¼NE¼ of Twp. 156N, Rng. 28W, Sec. 27; and the SE¼NW¼ of Twp. 156N, Rng. 28W, Sec. 26; within the proposed boundary of the area to be mined, are not listed in the lease with the State. Both of these parcels are listed as state properties according to the Koochiching Plat book that we referred to, and therefore should be included in the lease. However, having not been identified in the lease, and not covered under the Permit to Mine, these 93 Acres are not exempt from the mitigation or replacement requirements of the State's Wetland Conservation Act. Therefore, the EIS should include discussion of the proposed mitigation and restoration of 93+ Acres of land that will be affected by the mining operation, but which are not included in the lease. Item 27

Responses provided in Section 5.7.

WildLaw

A Non-profit Environmental Law Firm

North Woods Office
12005 41st Ave. N., # 201
Plymouth, MN 55441
e-mail: wildlawNW@aol.com

763/551-9979
763-551-9979 (fax)
www.wildlaw.org

August 28, 2001

Ms. Rebecca Wooden
Environmental Planner
Minnesota Department of Natural Resources
500 Lafayette Rd.
St. Paul, MN 55155-4010

re: Pine Island Bog Horticultural Peat Development
Draft Environmental impact Statement

Dear Ms. Wooden:

AUG 2 [illegible]

I submit these comments on behalf of Superior Wilderness Action Network, a non-profit environmental organization. These comments concern the proposal by the state to lease approximately 1200 acres of Pine Island State Forest to Berger Horticultural Products, Ltd., a Canadian company, for commercial horticultural peat harvesting. The irony is not lost on SWAN: the state proposes to destroy a relatively intact ecosystem so that consumers can re-create a pretend ecosystem in terrariums or yards or hothouses or backyard gardens. SWAN opposes this proposal to remove all existing vegetation from approximately 840 acres. Item 1

Economics

The economic analysis for this lease lacks rigor. Yes, the fact of the matter is the population of Koochiching County is declining. Adequate opportunities must be developed in this geographic area to maintain this way of life for the local residents. Five full-time jobs and 40 seasonal jobs are not going to fix the unemployment problem. In fact, there is no guarantee that a Canadian company is going to hire local residents. Rather, these jobs could go to employees already employed by Berger Horticultural Products, Ltd. in Canada. Item 2

SWAN is also concerned as to the costs of road construction and reconstruction that will be shouldered by the State or the County. Half a million dollars appropriated by the state legislature obviously will help, but this road, according to the DEIS, has never experienced heavy Item 3

traffic. So, whereas the county and/or state has spent 5,000/year for upkeep, isn't it logical to assume the cost will increase with increased traffic?

Irretrievable Losses

Item 4

Sphagnum Moss grows at the rate of 1 mm/year. (DEIS p. 4-25). Currently, the depth of the moss cap is 6 feet thick; it has taken approximately 2000 years to create this thick of a moss cover. (DEIS p. 4-25). According to the EA, only 3,160 acres of raised bogs contain a moss cap greater than 5 feet. So, apparently, it is rare to have moss this thick and, consequently, it can be argued it will take considerably more than our lifetimes to grow back to the current thickness.

The EA notes that a 40 year old Black Spruce tree has a dbh of 1 1/4 inch. The vegetation on the Pine State Bog has at least two hindrances to growth: the acidity of the soil and the climate. Logging and removing metric tons of soils would be devastating to any area of land, but in the northwoods restoration also has to acknowledge the shortened growing season and the harsh weather. The restoration the DEIS touts– vegetative cover within a decade– is not restoration at all, but simply the first inch of moss growth. Vacuuming up all the vegetation and seeding the area with soil and plants from an untouched bog– not identified in the EA– is not restoration, but the first step in a centuries-long process.

Peat mining is a one-shot deal; it is not a renewable resource.

Item 5

What about the opportunity to re-introduce caribou to northern Minnesota? Caribou habitat is bog habitat.

Mercury

Item 6

According to information provided by Minnesota's Office of Environmental Assistance and the Minnesota Pollution Control Agency, when mercury is deposited in lakes or waterways, bacteria convert it to methyl mercury. Methyl mercury accumulates in algae and is eaten by smaller fish, which in turn are eaten by larger fish. Fish at the top of the aquatic food chain, such as walleye, can have methyl mercury concentrations as high as 130,000 times that of the surrounding water.

Unfortunately, the mercury in fish also concentrates in the tissue of any human or wildlife eating the fish. If contaminated fish are eaten on a regular basis, mercury concentrations can become high enough to become a serious health threat to humans. Several Great Lakes states issue advisories each year, cautioning people to limit the amount of fish they eat from area lakes.

Until it is buried in lakes or ocean sediment, mercury has the potential to build up in fish. Because of mercury's mobility, the longer it escapes to the environment, the longer it will take to reduce mercury contamination of fish. Five species of fish live in the drainage ditch between the Pine Island Bog and the Black River. Is it too much to assume that

fish in the ditch, which may have a higher rate of mercury contamination, can swim to the Black River? Therefore, mercury-contaminated fish could be eaten by bigger fish in the Black River resulting in accumulation of methyl mercury?

Obviously, a key concern is to lessen the release of methyl mercury into the water and air. From the information provided in the DEIS, it appears that the mercury is now "buried" in the peat of this bog, not contaminating fish and, consequently, humans. Once the mercury is released from this bog, then where it goes is anybody's guess. This project cannot go forward until the true release of mercury from mining is known. It is too late to disclose this information in the NPDES permitting process. By that time, the company will argue that too much time and money has been spent to stop the permitting process regardless of the amount of mercury to be released into the water and air. The company will have to release this data at some point. Now is better than later. SWAN does not understand how the DNR can sign-off on a project that will very likely exacerbate the mercury contamination in state waters for which it is responsible. The DNR will have to deal with this mercury problem at some point either now, or when it finds its way into the Black River or a lake The amount of mercury in the Pine Island bog is more than twice the levels of Kjostad Lake and the levels from Alaska. (DEIS p. 4-24).[1] Not only is this significant, but health and safety issues must be adequately addressed with the proper mitigation measures in place.

Item 7

Whereas the total mercury concentrations observed in the Pine Island bog water samples may be consistent with those observed in other peatlands and drainage water, other peatlands are not being harvested and other drainage water may not be emptying into a river with contamination warnings such as Black River. These two site-specific factors must be considered in the analysis of gauging the true impacts and crafting effective mitigation measures.

The Pine Island bog occupies a headwaters area. (EA p. 4-5). The bottom line is that the Pine Island bog is a source of methyl mercury. According to Table 4-6, no amount of methyl mercury is considered standard in 2B waters, which is why the Black River has a fish consumption advisory. According to that table, the concentrations in the river are now .18ng/L and the Pine Island bog drainage will be at levels of .29-.96 ng/L. Does it really matter that total Mercury levels will be within the state standards when the amount of the methyl mercury will possibly increase as much as five-fold?

Item 8

Methyl mercury is not the only concern: aluminum, dissolved organic carbon, phosphorus, orthophosphorus, and turbidity will exceed state standards. (DEIS Table 4-6). The DEIS states

[1] The DEIS contains the enigmatic statement: "The historic baseline concentration and the temporal trend in the Pine Island Bog are in good agreement with literature data as shown in Figure 4-8 that compares the Pine Island Bog data with concentrations in sediments of an Alaskan lake and Kjostad Lake, which is located in Lake County in northeast Minnesota." (DEIS p. 4-25). What is "good agreement" when the data shows mercury levels more than twice that of Cook County?

that phosphorus should not be a problem since it is tightly bound to peat particles, but what is to happen when more ditches are put in place? What happens when drainage is increased?

The influx of nitrogen and phosphorus will stimulate the growth of algae in natural waters upon receipt of bog water. Humic substances in bog waters may be toxic to plants and animals in the receiving waters. This bog is doing us a service by removing mercury from the atmosphere and preventing it from reaching a water supply or a fishing hole.

Lack of Alternatives

Item 9

The DEIS has only one alternative, which is not sufficient. There is no alternative where the Berger company mines fewer acres, or where the mining of the whole 840 acres is contingent upon the company demonstrating a successful mining of a smaller portion, say one-fourth of the total.

Black Spruce

Item 10

Black spruce provide habitat for the Boreal Owl, a species know to occur in Koochiching County. (Appendix A, p. 7). The Department of Natural Resources has the responsibility to promote the "establishment of scientific forestry principles in the management, protection, and promotion of the forest resources of the state. The DNR should consider the irretrievable loss of forest products in this mining proposal.

Cumulative Impacts

Item 11

SWAN is concerned as to the cumulative impacts this proposed lease may have on the vegetation donor site. If the donor site will be harvested to reclaim the Pine Island bog, then what will the impacts to that site be?

Item 12

Why was the bog data collected in October and November and not the spring or summer? Is this an accurate portrayal of the hydrology? Can accurate data be gathered at one time of year alone, during one visit? What about plant identification?

Item 13

Why was vegetation and water chemistry data not collected on the open bog and fen communities to the south of the impacted area when the EA acknowledges that runoff will go into the Sturgeon River? How did the DEIS arrive at the following conclusion, which contradicts previous statements asserting runoff into the Sturgeon River: "given that the majority of proposed harvesting in the Pine Island Bog is to the north of the topographic high point of the bog, disruptions of flow to the south are likely to be small." (DEIS p. 4-13). Figure 4-2 represents a topographic map which shows that approximately 1/3 of the mining will occur south of the highest point, therefore draining (interrupting the draining) to the Sturgeon River over the fen. See p. 4-4.

Loss of Wetlands

Item 14

The company makes much of the fact that is a degraded bog already with three ditches from the futile attempts at the turn of the last century to make this agricultural land. The three ditches could not drain the bog and attempts at farming failed. While the ditches may mean this area is not pristine or untouched, the area certainly is not exploited beyond recognition as it will if the mining goes forward. The EA states that there is only localized vegetative changes in the area of the ditches as opposed to the wholesale change in the area.

How many wetlands have been lost in Minnesota in the last twenty years? Where will the replacement wetlands come from? How will the company replicate an environment that took over 2000 years to create?

Insufficient data

Item 15

What is truly perplexing is the fact that the DEIS documents oddities and irregularities, but then dismisses these concerns with flippant, shallow guesses. An excellent point can be found in the discussion on the chemistry of the water running of the discharge off the bog. Neither the company nor the state has seen the need to collect precipitation and flow data at the specific location of the Pine Island bog. Rather, the DEIS relies on data gathered from another site to reach conclusions. This does not satisfy the requirements for an EIS.

Based on the average regional annual runoff data, the authors of the DEIS surmised what the average Pine Island bog runoff should be. Instead of the expected discharge flow, the actual discharge flow was more than twice the expected figures. (DEIS p. 4-22). Since actual discharge flow was measured on only one date, October 31, 2000, no reasoned explanation can be put forward. Instead, the DEIS states, "This [the actual flow] may indicate that there was substantial groundwater flow entering the ditches (refer to Figures 4-3 and 4-6), or that recent precipitation and high groundwater tables resulted in greater than normal discharge flow on that date." (DEIS p. 4-22). Well, what is the significance if the high groundwater tables resulted in the high discharge flows? Does that change the impact of the mining proposed?

The DEIS contains conclusory statements: "The proposed settling basins would reduce the turbidity in discharged water, but aluminum is likely to be in solution or sorbed to very small particles, and will not be removed in settling basins." (DEIS p. 4-35). What substantiates the first clause of that sentence?

Item 16

What about all the DNR studies conducted back in the late 1970s and 1980s. Where is the Walter Butler Co. study from 1978 that was commissioned by the DNR as part of 1.25 million study? That report said large-scale peat extraction could release harmful chemicals and poisons, and the report questions whether economic benefits would be well-distributed.

Mitigation Measures

The DEIS relies on vague, advisory mitigation measures. "It is recommended that water retention times be extended to 48 hours....."; "TSS levels in discharged water should be monitored at least once per month during each season, and possibly after strong rain events." (DEIS p. 4-36). "Recommended" and "possibly" are hard to enforce. Item 17

The next environmental document needs site-specific mitigation measures for measuring and mitigating harm from the release of heavy metals and other toxins. The next environmental document needs to identify wetland replacement ratio.

Botanical attributes

Nothing in the EIS addresses the impacts to plants. What vascular plants are in the area? Is the 1984 Ecological assessment of peatlands part of the administrative record? What did that analysis find in this area? Item 18

Exploitation

The Pine Island Bog is a remote area surrounded by a sparse population. Promising a few jobs, that may or may not be filled by local citizens, measured against possibly serious health effects offers little in the hope of economic diversification. Until the health effects are addressed and an economic analysis is conducted comparing the amount the state spends on mercury reduction and the amount by which that outlay will be increased by this mining, the proposal suffers from serious flaws. Item 19

Thank you for your time and attention to this matter. Please keep my name on the mailing list for this project.

Sincerely,

Leigh Haynie,
Attorney for SWAN

Sept 7, 2001

Dear Comissioner Harberg (or whoever reads this);

~~In regard to the Pine Island Peat Project:~~

Comments made at the August 20th meeting were NO exaggerated! I remember the Pine Island Station. There was a house, a bunkhouse, and a garage.... sold by the DNR. In 1970 I went to the airstrip with my Dad. The Boy Scouts had their annual International Jamboree there. The airstrip was full of tent and activity. (My Dad worked for DNR — Pine Island Dist.)

As you know, there were people who used to live in the area of the Bogs. There was even a school house. (We went there with a former teacher — no sign it had been there/no artifacts)

One thing not mentioned was that the Big Falls/Pine Island District is classified as a Military Operations Area. **Item 1**

Then there are the ditches already in place. These ditches already deposit above-government-level sediment in the river. Berger would add a small amount more. They plan on building a sediment pond. Even if there is still sediment going into the river — won't it be somewhat less than if Berger were NOT there? **Item 2**

Does this area really sound "pristine" or "untouched" as some say? I can't imagine anyone with knowledge of the activity in the area would think so!!!

Sincerely,
Betty Parker
Box 3514
Big Falls, MN 56627

Responses provided in Section 5.9.

DAN WILM
35559 NORTHVIEW HARBOR DRIVE
PEQUOT LAKES, MN 56472
218-543-4180
SEPTEMBER 10, 2001

REBECCA WOODEN, ENVIRONMENTAL PLANNER
MN DNR
500 LAFAYETTE ROAD
ST PAUL, MN 55155-4010

Rebecca:

Enclosed are my comments addressing the MN DNR's Draft EIS. I appreciate the opportunity to comment on this document. My comments are based as a citizen of the state of Minnesota, who lived and worked in Koochiching county for 17 years, most of that time working within the Pine Island State Forest, and living in Big Falls for 10 years. I am intimately familiar with the proposed peat mine area, the staging area, the road upgrades, and the gravel and fill sources. I am also very familiar with many of the citizens of Big Falls, and the local politics of the area.

Item 1

The very narrow and limited discussion of the socio-economic is the biggest disappointment of the draft EIS. Beginning on page 4-48, section 4.2.4.2., the discussion is limited only to the economic impacts of the local citizenry, which I would guess then in turn affect only the socio aspect of the local citizenry. This proposal affects a huge portion of state lands in Koochiching county. Its short sighted at best and at worst ***shameful*** that other impacts to the general citizenry of Minnesota were totally ignored, in spite of comments and suggestions submitted to your office as part of the scoping document for the EIS. Why isn't the socio-economic aspect ***inclusive*** of all the citizens of Mn, the impact of such a large development on State of Mn land, in the middle of the largest state forest in Minnesota? It is critical that the DNR address the exploitation of the area for a very limited financial gain, which will only favor the people who already have the power and financial resources!! Loss of unspoiled, quiet lands and affecting such a large area is not discussed at all, including those intangible benefits to the ***health of society*** which affects ***us all.*** The last paragraph entitled employment effects is speculative in the number of jobs and the pay, according the Bergers own figures. This last paragraph also includes mention of jobs such as pallet production. This would be a separate related action which in turn needs to be discussed in detail, as the wood supply for these pallets is questionable.

Item 2

Page 4-5, section 4.2.1.1.2 discusses the wetlands plant community of the Pine Island bog. It states that "a detailed biological survey of the site was not available, however the following description of the Pine Island bog plant community is presented based on aerial photos, reconnaissance reports (by whom and what are their qualifications?) and descriptions of similar raised bogs in the area". Obviously, this is woefully inadequate. A thorough biological inventory must be done throughout the growing season to capture all the plants, such as the rams head lady slipper. Timing is critical in order to capture these plants presence, and the slipshod anecdotal data is insufficient here.

Page 4-94, sections 4.3.17.2 & 4.3.17.31 discuss the fill and gravel sources. There is not a detailed description of the plant material growing on this area, nor a detailed inventory of the fill material, nor a discussion of the impact of using such a large supply and its effects on road maintenance on other state forest roads in this area. The pit location for fill is the SENWSE 32-156-27. The primary source for the gravel is in 23-155-25. A detailed aggregate inventory of this site has been done. However, in both the fill source and gravel source, there was no discussion of the ***loss of highly productive timberland and its benefits, nor any mention of mitigation to offset this loss.*** No mention of what the future plans are on the upgraded Pine Island road will be, once it is turned over to Koochiching county. More than likely, the Pine Island road will be upgraded again, including blacktopping the surface. Where will the aggregate come from then?

Item 3

Item 4

Item 5

The following comments are more general in nature. There is no solid provision for enough up front money from Berger to ensure adequate sphagnum peatland reclamation. We are talking about a process that will take thousands of years, and lots of monitoring and adjustments to ensure success. Is it the intent of DNR Minerals to allow the ***citizens of Minnesota*** holding the bag on these costs?

Item 6

Finally, it is stated in the reclamation of the peatland portion of the draft EIS that reclamation could actually be easier in a split watershed (which this area is)? Could there be a more detailed discussion of that theory? It flies in the face of logic that this could be true, especially when in many parts of the draft EIS it is stated that the drainage of this bog is not fully understood.

Item 7

Respectfully,

Dan Wilm

Report

Mercury in the Pine Island Bog

to:

Rebecca Wooden
Office of Management and Budget Services
Minnesota Department of Natural Resources

From:

Edward A. Nater, Ph.D.
Department of Soil, Water, and Climate
University of Minnesota

Introduction

Proposed peat harvesting operations on Pine Island Bog in Koochiching County, northern Minnesota have spawned concerns over the release of mercury (Hg), and specifically mono-methyl mercury (a more toxic and bioaccumulative Hg chemical species), into surface waters downstream of the operations. In order to assess the potential impacts, we were asked to collect samples of peat pore waters from the bog and the bog outlet stream waters and analyze them for total Hg, mono-methyl Hg, and sulfate.

This document reports the results of those analyses and interprets the data within the framework of our current scientific understanding of Hg behavior in the environment. Interpretative references will be made to results of unpublished studies currently being conducted at the Marcell Experimental Forest north of Grand Rapids, MN, by the author and other collaborators on a US EPA STAR grant. These data are copyright by the author and are not to be re-published or used for purposes other than the interpretation of the data collected from the Pine Island Bog without the express consent of the author.

Sampling and Analytical Methods

Samples were collected from Pine Island Bog on 9/18/2001 to be analyzed for total and mono-methyl Hg, sulfate content, pH, electrical conductivity, and peat temperature. Air temperature was 21 C and conditions were overcast. The sampling party included:

Mike Berndt, DNR-Division of Lands and Minerals, St. Paul.
Ed Nater, University of Minnesota-Twin Cities
Kurt Johnson, NRRI- University of Minnesota-Duluth
Tom Malterer, NRRI-University of Minnesota-Duluth

Samples sites included two locations within the bog and a single site at the bog drainage outlet. Site 1 was located at position 26-11 in the Pine Island Bog, corresponding to the "East Bog Site" in Melchert et al. (1997) while Site 2 was located at position 27-11 and corresponded to the "West Bog Site" from the same study. The third site was located approximately 25 meters south of the intersection of the Pine Island Bog drainage ditch and Pine Island forest road.

Shallow (approximately 30 cm below the peat surface and 7.5 cm below the water surface) and deep (approximately 1.5 m below the peat surface) peat pore water samples were taken. Deep samples were

taken by inserting a 1.25-inch PVC tube 1.5 meters into the peat. Peat pore waters entering the tube were collected by pumping through a fritted glass tube. Shallow samples were taken initially by placing the fritted glass tube directly into the peat and pumping peat pore water directly from the peat itself. This worked well for Site 1 but at Site 2 the fritted glass plugged almost immediately with particulate matter. A second, clean fritted glass tube was inserted into the peat, but it plugged immediately, too. The shallow sample at Site 2 was eventually taken by inserting the 1.25 inch PVC tube 12 inches deep into the peat and pumping waters that filled the tube directly with an open, unfiltered Teflon tube. This particular sample had more particulate matter than the other samples did, due largely to the lack of filtration by the fritted glass tube.

Three samples were taken at each site. The first sample was analyzed for sulfate, conductivity, and pH. A second sample was analyzed for total Hg, and the third was analyzed for mono-methyl Hg (often called methyl Hg). A fourth sample was taken for OC (organic carbon) analysis, but is still awaiting analysis. Samples for total Hg, mono-methyl Hg, and OC analyses were placed in 125 mL Teflon bottles and preserved by addition of 1 mL of concentrated tested-clean HCl. Appropriate clean protocols were used at all times, and all materials contacting the pore waters (with the exception of the PVC tubes) were cleaned using techniques appropriate for total Hg analyses of surface waters.

Outlet waters were sampled by immersing a clean Teflon bottle in the stream and allowing water to fill it. Bottles were filled and emptied twice before collecting the sample. Care was taken not to disturb the sediment and to capture as little particulate matter as possible. Otherwise, samples were treated as above.

Samples were transported back to the laboratory for analysis, with the exception of conductivity and pH, which were measured in the field. Sulfate was analyzed by the Aqueous Geochemistry laboratory in the Department of Geology and Geophysics at the University of Minnesota. Analyses were conducted by Ion Chromatography. Total Hg determinations were performed by Cold Vapor Atomic Fluorescence Spectroscopy (CVAFS) following digestion of the sample by addition of 5.0 mL of BrCl (a strong oxidant) after the method of Bloom and Crecelius, 1983. Mono-methyl Hg determinations were performed by gas chromatography followed by detection by CVAFS (Bloom and Tsalkitzis, 1995). Samples were first distilled to concentrate mono-methyl Hg and to reduce the ionic Hg peak, then ethylated using sodium tetraethyl borate. The ethylated mercury species were released from the solution by bubbling with pure nitrogen gas and captured on a carbotrap. The sample was released to the gas chromatograph by heating to 250° C in a pure argon stream.

Our laboratory has a rigorous QA/QC policy that is in effect for all samples analyzed therein. These analyses passed all QA requirements.

Results

The results of the analyses are presented in the table below.

Site	pH	Temp (°C)	Conductance (μS)	Sulfate[(1)] (mg L^{-1})	Total Hg (ng L^{-1})	Mono-methyl Hg (ng L^{-1})
1 Shallow	3.84	12.2	80	0.067	10.0	1.66
1 Deep	3.90	11.3	80	0.034[(2)]	13.2	0.96
2 Shallow	3.88	12.2	80	0.031	133.4[(4)]	0.73
2 Deep	4.31	N/A	65	B.D.L[(3)]	14.3	0.34
Outlet	6.86	14.0	260	1.288	38.8	0.72

(1) The sulfate analyses of the filtered samples appear to be slightly contaminated, as the concentrations in the filtered samples are higher than in the corresponding unfiltered samples, which is not normally the case. There is insufficient volume in the particulates that could be filtered to account for this reduction by a dilution effect.

(2) Value from a filtered sample. An unfiltered sample was not preserved for this sample; hence, this value may be somewhat elevated.

(3) Below Detection Limit. Detection limit was 0.015 mg L^{-1}.

(4) Sample 2 Shallow was not filtered through a fritted glass tube as the other samples were. Instead, it was collected by pulling an unfiltered sample from the cavity inside a 1.25-inch PVC pipe that was pushed into the upper 6 inches of peat. This sample probably contained more particulate matter than the other samples due to the lack of filtration. Two frits were used to attempt to collect a sample at this particular site, but both plugged before 10 mL of sample could be collected.

Discussion

Sulfate concentrations in the bog are relatively low as expected, in part because Pine Island Bog is (mainly) a large, ombrotrophic bog, and as such, derives most of the mineral content in the surficial peats directly from precipitation. This is also evident in the low electrical conductivity readings. Because this bog is not downwind of any specific point sources, the total amount of sulfate added would be low. However, the values observed in the peat pore waters are lower than regional sulfate concentrations in precipitation. Annual volume-weighted means for sulfate concentrations in precipitation are 0.88 and 0.57 mg L^{-1} for NADP sites at Marcell, MN, and Voyageurs National Park - Sullivan Bay, MN. The values reported above are an order of magnitude lower.

Because plants selectively take up sulfur, there may be less sulfur in the water than was originally in the precipitation. Additionally, much of the sulfate may have been converted to sulfide by microbial activity. This would not be surprising in a reducing environment such as a bog, and is probably the case in the deeper samples.

Total mercury concentrations in the peat pore water samples, with the exception of the shallow sample from Site 2, are on the low range compared to other samples we have analyzed. Similar peat pore water samples taken throughout the year from the S-6 bog at the Marcell Experimental Forest north of Grand Rapids, MN, typically run from 7 or 8 to 50 and more ng L^{-1}, and are quite variable as well, which may be due in part to the particulate concentrations in the unfiltered samples. However, samples taken with fritted glass tubes from saturated peat blocks in our laboratory also show large variability in total Hg concentrations.

Methyl mercury concentrations in the peat pore water samples are about one third to one tenth of the values we commonly observe in samples collected from the S-6 bog at Marcell. Marcell peat pore water samples commonly range from 0.8 to 10 ng mono-methyl Hg L^{-1} with occasional higher values. The majority of sample concentrations range from 2 to 5 ng L^{-1}. The lower mono-methyl Hg values observed for the Pine Island Bog are probably related to the lower sulfate concentrations measured there. We know that sulfate reducers are the primary organisms involved in the chemical transformation of ionic Hg to mono-methyl Hg, and that additions of sulfate to lake water samples will enhance the rate of methylation and increase the mono-methyl Hg concentrations in waters. This is also true for addition of sulfate to peat blocks in the laboratory.

The concentration of total Hg in the Pine Island Bog outlet waters (38.8 ng L^{-1}) is somewhat higher than we observe from peatland outlet waters at Marcell. Outlet concentrations at Marcell in unfiltered samples range from 2-3 ng L^{-1} for S-3, a rich fen, to 6 - 8 for S-2 and S-6, good ombrotrophic bogs, to 20 to 30 ng L^{-1} for S-7, an ombrotrophic bog that has been ditched to lower the water table. These numbers represent the "normal" range in concentrations during the hydrologically-active portion of the year. Higher and lower values are observed at times. These concentrations were measured in unfiltered samples, as was the sample from the Pine Island Bog outlet. In our laboratory we do not normally filter outlet waters due to the difficulty of filtering these waters and the potential for contamination produced by the addition of an extra step in the sample handling process. The total particulate concentration in outlet waters may, indeed, affect the total Hg concentration, but in our experience, that has been a minor component of the total, typically less than 20% (Fleck, 1999).

Concerns Associated with Peat Harvesting Operations

From our experiences at Marcell, we would expect to see an increase in total Hg in outlet waters following drainage of a peatland. The physiography, size, vegetation, and composition of S-2, S-6, and S-7 bogs at Marcell are all fairly similar. In 1967 a ditch was dynamited through the center of S-7 to enhance drainage and lower the water table in the peatland, currently about one to two feet lower than it was prior to ditching. The purpose was to investigate the effect of enhanced drainage on tree growth on organic soils. Although the ditch has been in place for more than 30 years, the concentration of total Hg in output waters from S-7 is still about three times higher than that from the other two bogs (20 to 30 ng Hg L^{-1} as opposed to 6 to 8 ng Hg L^{-1}), suggesting that the enhanced drainage has increased total Hg output. The more rapid decomposition of organic matter in the better aerated, drained condition should release more of the organically-bound Hg into the drainage waters.

A series of drainage ditches were excavated at the Pine Island Bog site in the early 1900s for agricultural development (Draft EIS). These ditches remain, and are a source of water for the north outlet. At the time of our sampling, a large beaver dam had been constructed near the source of the outlet and was holding water behind it. We were not able to discern its effects on the water table within the bog, but presumably it had some (at least temporary) effect on water levels. Because of this uncertainty, it is difficult to tell how the total and mono-methyl Hg concentrations obtained in this study relate to future behavior of the outlet waters once ditching for peat harvesting is completed and the bog is fully drained.

Although our data only go back two years, based on the similarity in physiography and other characteristics between S-2, S-6, and S-7, we suspect that this enhanced output of total Hg from S-7 is an artifact of drainage, and that the concentration of total Hg in output waters prior to drainage was approximately the same as that observed for S-2 and S-6. Further, we suspect that, in the first few years following drainage, total Hg concentrations in output waters were even higher than they are today. I would expect similar results following drainage of Pine Island Bog prior to peat harvesting.

The good news is that drainage does not appear to significantly affect the concentrations of mono-methyl Hg in output waters. Mean annual mono-methyl Hg concentrations from S-2, S-6, and S-7 are 0.43, 0.53, and 0.65 ng L^{-1}, respectively. The differences were not significant. Sulfate reducers are the main organisms responsible for conversion of total Hg to mono-methyl Hg; theoretically, then, better aeration (the presence of available oxygen) should alleviate the need for microbes to use sulfate as an alternate electron acceptor, thus reducing the amount of methylation occurring near the surface. However, methylation may occur at greater depths close to the surface of the new water table, thus producing the mono-methyl Hg concentrations observed. We would not, however, expect to see an increase in mono-methyl Hg concentrations following initial drainage in preparation for harvesting.

References

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