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Kennecott

January 11, 1994

Department of Natural Resources
Mr. Tom Bauman
P. O. Box 7921
Madison, WI 53707-7921

RE: Flambeau Mining Company, WPDES Permit No. WI-0047376-1

Dear Tom:

According to our Wisconsin Pollutant Discharge Elimination System (WPDES) permit, Flambeau Mining Company (Flambeau) is required to complete bioassay analyses of the effluent discharged from the water treatment system. On December 7, 1993 sampling was initiated for completion of both acute and chronic bioassays. The samples were submitted to a commercial laboratory. The Wisconsin Department of Natural Resources (WDNR) split these samples for comparative analyses.

The chronic bioassay demonstrated full compliance for all organisms within the limitations defined in Part I, Section E.(5)(b) of the WPDES permit. The acute bioassay demonstrated a positive reaction to the Ceriodaphnia dubia (C. dubia) in the 100% effluent as defined in Part I, Section E.(5)(a) of the permit. The analysis using a 50% dilution demonstrated 100% survival of the C. dubia. All the other acute tests for both Daphnia magna and the fathead minnow (Pimephales promelas) demonstrated full compliance with Part I, Section E. (5)(a) of the permit. Because of the 100% survival of the C. dubia in a 50% dilution with river water we feel that no environmental damage has resulted from the discharge of this water. Flambeau's actual dilution factor for an instream waste concentration was 0.1% on December 7, 1993. This provides 500 times more dilution than that shown to achieve 100% survival of C. dubia. The results of the acute and chronic bioassys performed on samples collected December 7-13, 1993 are forthcoing under seperate cover.

The fact that only the acute test, at 100% effluent, demonstrated a positive result while all the other tests, including the chronic test with 100% effluent demonstrated full compliance, led us to believe that the study would demonstrate that very minor adjustments were needed to bring the system into full compliance.

Flambeau's historical data has shown that the effluent has passed the bioassay tests every time except on samples collected September 13, 1993. The reason for the previous positive reaction to the bioassay was determined and corrected. We do not believe that the December 7, 1993 positive reaction has anything to do with the tests that were run on samples collected on September 13, 1993.

Part I, Section E.(8)(a) requires a plan to be prepared when any two acute test batteries within a twelve month period, are determined to be positive. A plan of investigation was immediately formulated with the assistance of Gerald Berg from Foth and Van Dyke as the coordinator. The majority of the work associated with our investigation has already been completed. All procedures used in the completion of this work comply with our Quality Assurance/Quality Control Plan as described in our WPDES Permit; there were no deviations. The conclusions of this work is described in this letter, as well as our plan for further investigation. Given the circumstances, and the depth of work so far undertaken, we are submitting this letter to fulfill our requirement under referenced Part I, Section E.(8)(a) of the WPDES permit for a Toxicity Reduction Evaluation (TRE) Plan.

Those areas evaluated to determine the cause of the positive reaction to the acute bioassay from the sample collected on December 7, 1993 are as follows:

A. Lime Treatment Process - Grab samples of the clarifier overflow were submitted to a commercial lab for acute bioassays. The lime treatment process continues to be evaluated for its metals removal efficiency.

B. Sulfide Treatment Process - Factors determining adequate sulfide feed rates were re-evaluated. Controls have been modified to regulate the sulfide feed rate based on the desired application rate.

C. Sand Filter Operation - The effectiveness of solids and metals removal in the filter system was evaluated. The determination was made that the filter was re-solubilizing metals. A modified backwash was implemented to improve filter performance.

D. Sulfide Toxicity - Sulfide toxicity was evaluated by spiking lab control water with sodium sulfide and performing acute bioassays with C. dubia. The results show there is no toxicity associated with sulfide at concentrations within the effluent. The degradation of sulfide over time was verified in bench scale testing.

E. Polymer Toxicity - Polymer toxicity was evaluated by spiking lab control water with polymer and performing acute bioassays

with C. dubia. The results show there is no toxicity associated with polymer at concentrations within the effluent.

F. Metals Removal - Metal analyses were performed on bioassay samples to determine if metals concentrations could have potentially produced the positive reaction. With other factors interacting it is difficult to pinpoint metals as the primary reason for the positive result.

G. Hardness Impact on Bioassays - Effluent samples were spiked with $CaCO_3$ to increase hardness. Acute bioassays were performed with C. dubia. No conclusions can be drawn due to 85-100% survival rate of C. dubia in unaltered 100% effluent. Hardness analyses are performed on effluent samples submitted for bioassays.

H. Nutrient Deficiency - Acute bioassays with C. dubia were performed with feeding. No conclusions can be drawn due to 85-100% survival rate of C. dubia in unaltered 100% effluent. Nutrient analyses are being performed on effluent samples submitted for bioassays.

While each area can be considered as an independent variable, the interrelationship of factors must be considered in the overall evaluation of the positive result.

The areas above can be placed in two general categories. The first category (G & H) was the lack of nutrients or hardness in the water. Organisms as fragile as the C. dubia have demonstrated a need for nutrients in bioassay analyses. The second category, (A-F) was the performance of the water treatment facility.

When Flambeau received preliminary indications that a positive reaction was developing in the acute test for samples collected on December 7, 1993 we immediately began to look for reasons for the reaction.

In the evaluation of records, it was found that concurrent with the positive reaction operational data for the treatment system had shown a slight decrease in the efficiency of the final filter system. This change in efficiency was small and the chemical specific effluent limits for the discharge water were never violated. On December 10, 1993 the operators completed a more rigorous backwash of the final filters for improved efficiency.

As samples were collected on December 13, 1993 for the chronic bioassay test, a second acute test for C. dubia was undertaken using the same sample. This test demonstrated 100% survival in 100% effluent.

A series of additional bioassays were run in the following weeks to evaluate Items A through H listed above. In all cases, the 100% effluent tests demonstrated excellent compliance with the permits conditions with C. dubia survival at 85-100%. In addition to the tests that were completed to evaluate potential reasons for the positive reaction, the WPDES permit, Section E.(2) and E.(6) requires that two acute bioassays be completed within 30 days following a positive reaction. These tests were completed and demonstrated negative toxicity with 85% to 100% survival of the C. dubia; results are forthcoming under seperate cover. A summary of the data is listed below:

ACUTE BIOASSAY RESULTS
DECEMBER 21-25,1993

ORGANISM	MEAN SURVIVAL 100% EFFLUENT	MEAN SURVIVAL 50% EFFLUENT	COMPLIANCE WITH PERMIT
C. dubia	85%	100%	YES
D. magna	100%	100%	YES
P. promelas	100%	100%	YES

ACUTE BIOASSAY RESULTS
JANUARY 6-10, 1994

ORGANISM	MEAN SURVIVAL 100% EFFLUENT	MEAN SURVIVAL 50% EFFLUENT	COMPLIANCE WITH PERMIT
C. dubia	100%	100%	YES
D. magna	100%	100%	YES
P. promelas	100%	100%	YES

The only significant change that was made after the positive reaction in question was the rigorous backwash of the final filter. This has resulted in Flambeau modifying the standard operating procedures for the water treatment system to include a more rigorous backwash on a routine basis. Flambeau will continue to monitor the performance of the filter on a routine basis. If a decrease in efficiency is identified in the future, additional steps will be taken to address the filters performance.

Part I, Section E.(8)(b) of the WPDES Permit allows the Toxicity Reduction Evaluation (TRE) to extend over a three month period. Although Flambeau believes that the actions taken to improve the backwash of the filter media have eliminated the reason for the

positive reaction to the acute bioassay, we intend to continue the investigation by soliciting advice from experts in the field of C. dubia toxicology. Dependent on their advice we will undertake further tests to determine precisely the nature of the C. dubia random mortality. We will keep you advised of our progress.

Should you so desire we would be pleased to share the detail of the tests with you at your convenience.

Sincerely,

Jana E. Murphy

Jana E. Murphy
Supervisor of Environmental Affairs

JEM/cg

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