Document Type Group	**Permitting – Effluent Limits Review**
Document Type (choose/circle one) (if you choose Preliminary ELR you must choose the WWPS Document Name 'Preliminary ELR' below)	Antidegradation Reviews Effluent Limit Review (ELS and Checklist) Impaired Waters Review Low Flow Calculations Phosphorus Reviews Receiving Water Monitoring Review Toxicity and Chemical Additive Reviews NPDES Historical Highlights WLA Intensive Survey AT/WLA Report Preliminary Effluent Limit Review
Document Date	May 22, 1984
Preferred ID	MN0055301
Preferred ID	North Shore Mining Silver Bay
Public or Not Public (choose/circle one)	Public Not Public
Subject/Topic/Title (briefly describe what this is. If you saw this on a list in a query would it give you enough information?)	Proposal before the MPCA Board to allow a discharge from Mile Post 7 / Gary to the 11 acres
Site/Facility Name	North Shore Mining Silver Bay
City/Township	Silver Creek Township
County	Lake
Document Author (last name, first name)	Criswell, Robert and Sparks, Curtis
Wastewater Point Source Document Name (choose/circle one) (if you choose Preliminary ELR you must choose the WWPS File Sub Section 'Preliminary EL' below)	Antidegradation Review Ammonia Calculations Biological Monitoring Review Effluent Limits Review ELS & Checklist Effluent Limits Review Effluent Limits Review ELS (Final by Ind PW) Karst (groundwater) Review Wetlands Review Impaired Waters Review Impaired Waters Review Memo Low Flow Calculations Phosphorus Review Receiving Water Monitoring Data Review Receiving Water Monitoring Information Protocol Chemical Additive Review Toxicity Review NPDES Historical Highlights WLA Intensive Survey AT/WLA Report Preliminary Effluent Limit Review
Wastewater Point Source File Section	Effluent Limits
Wastewater Point Source File Sub Section (choose/circle one)	Effluent Limits Preliminary Effluent Limits

Use this sheet **only** for variance documents

Document Type Group	**Permitting – Application/Approvals**
Document Type	**Wastewater Point Source Variance**
Document Date	
Preferred ID	
Preferred ID	
Public or Not Public (choose/circle one)	**Public** **Not Public**
Subject/Topic/Title (briefly describe what this is. If you saw this on a list in a query would it give you enough information?)	
Site/Facility Name	
City/Township	
County	
Document Author (last name, first name)	
Wastewater Point Source Document Name	**Variance Review Documents**
Wastewater Point Source File Section	**Permit Development**
Wastewater Point Source File Sub Section	**Variance**

Permitting, Toxics, North Shore Mining Mile Post 7; May 22, 1984 Discussion of Proposal from Reserve Mining Company to Discharge from Mile Post 7 Tailings Basin, hand written note Etc by Gary Kimball

MINNESOTA POLLUTION CONTROL AGENCY
Division of Water Quality

Agenda Item Control Sheet

AGENDA # 13

MEETING DATE: May 22, 1984

APPEARANCE REQUESTED - YES: X NO:
SCHEDULED TIME:

PREPARED BY: Robert Criswell/Curtis Sparks

DATE PREPARED: May 4, 1984
DATE MAILED: May 11, 1984

SUBJECT: Discussion of Proposal from Reserve Mining Company to Discharge from Mile Post 7 Tailings Basin.

LOCATION: Silver Bay (City) Lake (County)

TYPE OF ACTION:

Permit		Request for hearing		New	
Stipulation		Request for legal action		Modification	
Contract		Variance request (feedlot)		Extension	
Policy		Rulemaking		Revocation	
Information	X	Administrative order		Other	

RECOMMENDED ACTION:

Issuance		Approval		No action needed	
Denial		Authorization			

ISSUE STATEMENT:

Reserve Mining Company (Reserve) has applied for a National Pollutant Discharge Elimination System (NPDES) permit to discharge treated wastewater from the Mile Post 7 tailings basin to the Beaver River near Silver Bay. The discharge is necessary due to excess accumulation of water in the basin. Consistent with the Minnesota Supreme Court decision on May 27, 1977, Reserve intends to treat the discharge in order to maintain water quality by utilizing best available technology. The proposed treatment facility is designed to discharge at a rate of 2,500 gallons per minute up to 3,500 gallons per minute. Commencement of discharge will be necessary by January, 1985 to protect the integrity of the basin dams. This item is presented to provide information on this issue so that timely actions can be taken to avoid delays resulting in potential dam safety issues. If a hearing is not requested or required, the staff intends to present the permit for issuance at the special Board meeting on May 31, 1984. If a hearing is requested and required, the staff intends to obtain authorization at the May 31, 1984 meeting.

ATTACHMENTS:
1. Draft Permit, Public Notice and Fact Sheet
   BAT Report from Consultant (Best Available Technology Evaluation of Asbestiform Fiber Removal Alternatives for the Minnesota Pollution Control Agency)
3. Letter to Alden Lind, Mr. Lind's Response, and Save Lake Superior Association Letter
4. Schedule for Permit Issuance
5. Summary of NPDES Contested Case Hearing Rules

MINNESOTA POLLUTION CONTROL AGENCY
Division of Water Quality
Permits Section

Discussion of Proposal from Reserve Mining Company to Discharge from Mile Post 7 Tailings Basin

May 22, 1984

ISSUE STATEMENT

Reserve Mining Company (Reserve) has applied for a National Pollutant Discharge Elimination System (NPDES) permit to discharge treated wastewater from the Mile Post 7 tailings basin to the Beaver River near Silver Bay. The discharge is necessary due to excess accumulation of water in the basin. Consistent with the Minnesota Supreme Court decision of May 27, 1977, Reserve intends to treat the discharge in order to maintain water quality by utilizing best available technology. The proposed treatment facility is designed to discharge at a rate of 2,500 gallons per minute up to 3,500 gallons per minute. Commencement of discharge will be necessary by January, 1985 to protect the integrity of the basin dams. If a hearing is not requested or required, the staff intends to present the permit for issuance at the special Board meeting on May 31, 1984. If a hearing is requested and required, the staff intends to obtain authorization at the May 31, 1984 meeting.

I. Background:

Reserve Mining Company has proposed to discharge wastewater which has accumulated in the Mile Post 7 (MP7) tailings basin by no later than January, 1985. Reserve has documented the need for the discharge by submitting a report from their consultant which substantiates that water is accumulating in the basin at a rate which will threaten dam integrity.

For the original design of the basin, at expected full production rates, it was anticipated that water from Lake Superior would have to be added to the Mile Post 7 basin, as normal runoff flowing to the basin would not completely replace the water which is dissipated in the plant processes. However, because of the reduced production of the last few years and

expected continuation of these lower production rates (approximately 45% of full production) for some time, all of the surface water runoff accumulating in the basin will not be dissipated in plant processes. The Minnesota Pollution Control Agency (MPCA) staff, the staff of the Minnesota Department of Natural Resources (MDNR), and Wahler Associates (MDNR consultant on dam design) have reviewed the hydrologic information of Reserve's and concur that the basin is accumulating water and a discharge is necessary. Reserve has also instituted additional water diversions at the MP7 tailings basin but this will not alleviate the need to reduce water levels in the basin nor at present production rates will it eliminate the imbalance of water which is causing the basin water to continue to rise. The point at which the incoming water to the basin balances the outgoing water from the plant processes is when production is at approximately 65%.

II. Discussion:

A. Reserve Mining Company Proposal

In order to reduce the existing basin water levels and reduce the impact of water still flowing to the MP7 tailings basin, Reserve has applied for a NPDES permit to discharge to the Beaver River. The average proposed discharge rate will be approximately 2,500 gallons per minute with a maximum of up to 3,500 gallons per minute. In order to meet MPCA standards, Reserve has proposed to construct a wastewater treatment facility similar to that which is employed to treat drinking water at

Duluth and other Northshore communities. The staff believes that the design concept and technology as proposed by Reserve is best available technology (BAT), and the draft permit proposes conditions to assure that Reserve's technology operates consistently with state requirements. Although Reserve has not yet submitted a schedule for completion of construction nor specific plans and specifications for the treatment plant, it is generally believed that the plant can be completed by January, 1985. The staff intends to require Reserve to submit a schedule of construction activities so that we may follow the project through completion.

B. Draft Permit

Attached with this memorandum is a copy of the draft permit public notice, and the fact sheet (Attachment 1). The terms and conditions of the draft permit require Reserve to implement BAT to maintain water quality, consistent with the May 27, 1977 Minnesota Supreme Court decision concerning Reserve's operations. The pertinent language of this decision reads as follows:

> "The permittee shall be required to apply the best available technology to maintain water quality and to comply with all applicable laws and regulations specifically including Minnesota Regulation WPC-14 and such other standards which now or in the future may be applied to the permittee's tailings."

Court Ruling

This decision further states that the above requirement shall apply to any water discharge from the tailings or catchment basin and such discharge shall be treated to the extent necessary to conform to all present and future water quality standards. We believe this further emphasizes the Court's intention to require that the specific goals of best available technology should be to assure that water quality requirements are met.

The development of the BAT, water quality, and other permit requirements was based primarily on a two-fold process. The first process was to evaluate existing water quality data collected for the MP7 tailings basin permit. The second process was to evaluate existing technologies to determine which technology was BAT and therefore best suited to assure that water quality conditions are met.

The existing permit for the MP7 tailings basin required the collection of data for stations upstream and downstream of the MP7 basin. Upstream stations were considered to be unimpacted by water sources although it was recognized that some changes in background could have occurred, during construction of the basin and also due to airborne emissions. Downstream stations were considered to be impacted by present day basin operations, as well as construction and airborne emissions. For this reason the upstream stations were chosen as the basis for establishing water quality numbers.

Based on staff review, amphibole fibers and fluoride were considered to be the parameters which were needed to maintain water quality. [redacted]. The amphibole fibers effluent limitation of 15×10^6 amphibole fibers per liter was based on a non-parametric statistical analysis procedure, which the staff has historically used to develop water quality and effluent limitations.

Of the existing technologies considered in the BAT review by staff and Agency consultants (Black and Veatch, Kansas City, Missouri) chemical coagulation and flocculation followed by direct filtration was considered to be present day demonstrated "state of the art" technology for removal of fibers. This review included evaluation of the performance of technologies including coagulation and flocculation, sedimentation, diatomaceous earth filtration, and granular media (sand, dual media, mixed media, magnesium oxide) filtration. The recommended technology, considering expected normal variation, can consistently provide removal of fibers at the 99 plus percent removal and therefore will comply with 15×10^6 daily maximum and 10×10^6 thirty day average amphibole fibers/liter effluent limitations. With proper operation, this technology can also meet fluoride water quality standards. This technology is similar to that used at Duluth and other Northshore municipalities for treatment of drinking water. A copy of the report prepared by the consultant is attached (see Attachment 2).

In addition to water quality limitations and monitoring requirements for fluoride and effluent limitations for fibers, the proposed permit also contains other conditions. These include the following:

1. Effluent limitations for total suspended solids and dissolved iron based on U.S. Environmental Protection Agency (EPA) guidelines for the Iron Ore Mining Subcategory.

2. Restrictions on the total discharge from the MP7 tailings basin which will be based on precipitation, as required by EPA Guidelines for the Iron Ore Mining Subcategory.

3. The pH limitations are based on state effluent requirements as contained in 6 MCAR 7050.0100-7050.0220 (WPC-14).

4. Operational and monitoring requirements for evaluating the effectiveness of the filter beds and for assuring that the system is operated as efficiently as possible.

5. A monitoring program including a fibers monitoring program for which Reserve will bear the cost.

C. Resolution of Environmental Organization Concerns

The primary concern raised by environmental organizations with the permit was the method by which the staff developed the fiber effluent limitations and not with the BAT technology which has been chosen to treat the discharge. These comments were primarily directed through Save Lake Superior Association (SLSA) and the Sierra Club.

The controversy centered around whether the permit effluent limitations for amphibole fibers should be more restrictive, since BAT technology could consistently be below the 15 x 10^6 and 10 x 10^6 levels required by the permit (i.e. likely in a range of 1 x 10^5 to 1 x 10^6). In addition, environmental organizations contended that the 15 x 10^6 number did not adequately represent background in that this number could include some contamination due to airborne emissions and pre-operational MP7 construction activities. On the first issue, the staff indicated that it was their belief that the Minnesota Supreme Court intended that Reserve implement BAT with the goal in mind of meeting water quality, as indicated by the excerpts from the decision and related discussions mentioned previously. Therefore, numbers based on water quality should appear in the permit. On the second issue, the staff agrees that the upstream stations could be affected by airborne emissions and pre-operational MP7 construction activities, but believes that the data which was used to set permit amphibole fiber effluent limitations is the best that is available and the monitoring stations where this data was obtained are the least affected in the Beaver River watershed.

The attached letter (Attachment 3) to Dr. Alden Lind of SLSA attempts to recognize and answer these concerns as raised by the environmental organizations. It should be noted that these concerns are likely most important as broad issues on how the Agency addresses the Minnesota Supreme Court Decision. For this

reason, it was necessary to recognize some of the limitations of our present data base which was used for setting the fiber standards in this permit. By doing this we avoid the controversy that this data base represents true background. Telephone conversations with the environmental organizations, based on the discussions as contained in this letter, indicate that the environmental organizations do not intend to request a public hearing. Furthermore, Alden Lind recommended to SLSA that they do not request a public hearing on the permit. The Board of Directors for SLSA has concurred (see Attachment 3).

D. Administration Scheduling Time Constraints

The MPCA staff has made every effort to proceed on this project in as thorough and rapid a manner as possible so that construction of the necessary facilities can be completed by the project discharge date. Attachment 4 is a schedule indicating the deadlines which were proposed, the date that each item was completed, and those deadlines which are remaining. Although we do not believe that a hearing is going to be necessary, our schedule does establish under item 13 an approximate date for a hearing if it is necessary. The Office of the Hearing Examiner has left its schedule open for the weeks of June 25, through July 13, 1984, so that a hearing could be held if necessary. It is important that the hearing be held at this time in order to assure that adequate construction time is available for completion of a treatment facility, as permit issuance cannot occur until after the Hearing Officer's findings have been

approved by the Board. Such approval could likely not occur until the July 31, 1984 meeting of the Board (schedule item #15). In order to meet the scheduling commitments indicated herein, a public notice of the hearing must be mailed during the week of June 4, 1984. This notice cannot be made until there is a clear statement of the issues after the close of the permit public notice on May 26, 1984.

III. Conclusions:

So that Reserve may begin construction of the proposed wastewater filtration plant during the summer of 1984 construction season, and thereby complete construction by the January, 1985 planned date of discharge, it has been extremely important in the review process to move forward as rapidly as possible and make every effort to cover for any contingencies which might occur. If a hearing is not requested, the staff intends to present the permit for issuance at the May 31, 1984 meeting. In the event that a hearing is requested the staff believes that the Board should be ready to act as rapidly as possible, so that hearings can be held in accordance with the schedule presented herein.

If a hearing is requested and the hearing request is in conformance with existing rules (see Attachment 5) then the staff intends to present their recommendation to the Board at the May 31, 1984 meeting and if required, request that the Board authorize a hearing to be held on the permit. An early

discussion of the matters presented herein and an informed Board is important so that a timely and appropriate action may be taken at the May 31, 1984 meeting.

IV. Recommendations:

The MPCA staff is making no recommendation at this time but only providing information that may be useful to the Board in anticipation of the May 31, 1984 meeting. At that time, the Board will be asked to make a decision to issue the proposed permit, or, in compliance with 6 MCAR 4.4013, to hold a contested case hearing.

Attachment 1

Minnesota Pollution Control Agency

APR 27 1984

Mr. A. H. Manzardo, Chief
Permits Section, Water Division
U. S. Environmental Protection Agency, Region V
230 South Dearborn Street
Chicago, Illinois 60604

Dear Mr. Manzardo:

RE: DRAFT NPDES PERMIT #MN 0055301
Reserve Mining Company
Silver Bay, Minnesota

As per the Memorandum of Agreement between the Minnesota Pollution Control Agency and the U. S. Environmental Protection Agency (EPA), we are enclosing for your review, one copy of the draft permit, statement of basis or fact sheet, public notice, and two copies of the completed application for the referenced applicant.

Provided that no objections or questionable comments are received during the public notice period and that no modifications are made to this permit, we are also requesting your concurrence for issuance of the referenced permit upon expiration of the public notice period.

By copy of this letter we are sending a duplicate of the public notice, fact sheet or statement of basis, and draft permit to the applicant.

Sincerely,

Curtis J. Sparks, P.E.
Chief, Permits Section
Division of Water Quality

CJS/RSC:cc

Enclosure (1)

cc: VIA CERTIFIED MAIL
Mr. Robert S. Lemire, Superintendent Environmental Control, Reserve Mining Company, Silver Bay, Mn.

Phone:_____
1935 West County Road B2, Roseville, Minnesota 55113-2785

Permit No: MN 0055301

PUBLIC NOTICE

for the

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)

AND STATE DISPOSAL SYSTEM (SDS) PERMIT PROGRAM

(Section 402, Federal Water Pollution Control Act, as amended, Minnesota Statutes Chapters 115 and 116, as amended, and 6 MCAR § 4.4001 et.seq. and 4.4101 et.seq.)

Draft NPDES and SDS Permit to Construct Wastewater Treatment Facilities and/or to Discharge into Waters of the State

Permits Section
Division of Water Quality
Minnesota Pollution Control Agency
1935 West County Road B2
Roseville, Minnesota 55113

Public Notice No: 44I-1380 Public Notice Issued On: APR 27 1984

Name and Address of Applicant:

Reserve Mining Company
Highway 61
Silver Bay, Minnesota 55614

Name and Location of Facility:

Reserve Mining Company
Highway 61
Silver Bay, Minnesota 55614

Receiving Water: Beaver River

NOTICE: The above named applicant has applied for an NPDES Permit to construct a wastewater filtration plant and to discharge into the Beaver River. The permit will be issued by the Minnesota Pollution Control Agency (MPCA) to Reserve Mining Company and it's parent companies Armco Steel, Inc. and Republic Steel Corporation for a period of approximately five years. The discharge will consist of treated tailings pond supernatant and surface water runoff. The wastewater filtration plant is designed to implement best available technology to comply with water quality standards.

Background

On April 19, 1978, the MPCA issued a permit to Reserve Mining Company (Reserve) and its parent companies to dispose of tailings at the Mile Post 7 tailing disposal basin near Silver Bay. That permit was based on a Minnesota Supreme Court decision setting forth certain requirements including that Reserve implement best available technology to meet water quality requirements. At the time this permit was prepared, because of the large quantities of water used in operating a taconite processing plant, it was believed that a discharge from the

Mile Post 7 tailings basin would not be necessary until closure of the basin. However, with the reduced rate of production (presently about 45% of capacity), which has occurred in the recent past and is expected to continue, water elevations in the basin have been rising. To further compound this situation, at reduced production rates, less course tailings are generated for dam construction. As a result, continued accumulation of water could threaten dam integrity. Reserve has indicated that a discharge will be necessary by approximately January 1985, necessitating construction of a wastewater treatment facility during the 1984 construction season.

Technology

In developing a standard for discharge, the MPCA is guided by the Minnesota Supreme Court decision of May 27, 1977 which states as follows:

> "The permittee shall be required to apply the best available technology to maintain water quality and to comply with all applicable laws and regulations specifically including Minnesota Regulation WPC 14 and such other standards which now or in the future may be applied to the permittee's tailings."

The decision further states that the above requirement shall apply to any water discharge from the tailings or catchment basin and such discharge shall be treated to the extent necessary to conform to all present and future water quality standards.

Based on this requirement the MPCA contracted a consultant to determine a treatment technology which would be the best available technology and which would assure that water quality was met. Based on the consultants review it was determined that best available technology would include chemical floculation followed by multimedia filtration.

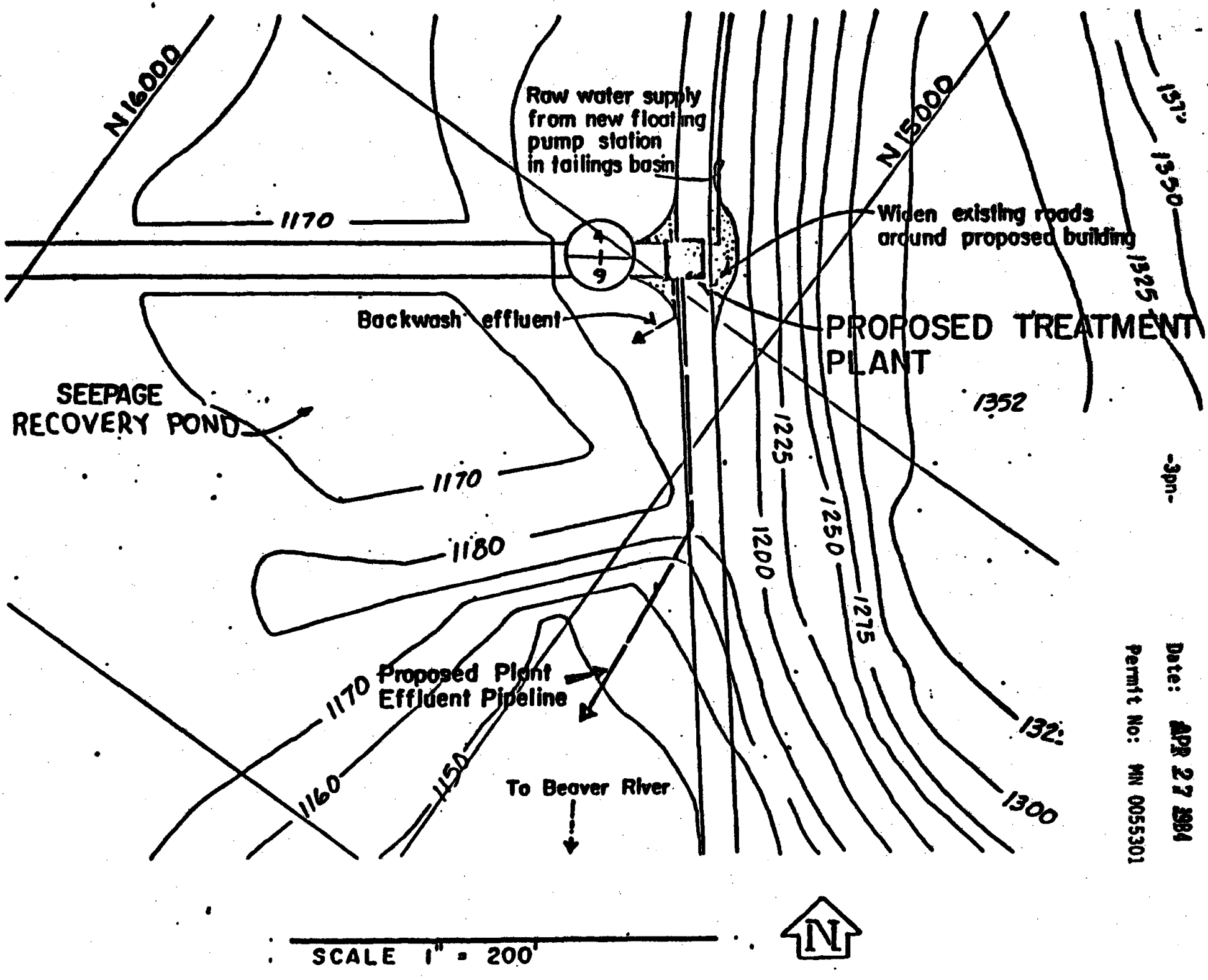
Reserve Mining Company Proposal

Reserve has proposed a water filtration plant for treating the proposed discharge. The technology which was proposed by Reserve consists of chemical floculation followed by multimedia filtration, and is like that proposed by the MPCA consultant. This technology represents present state of the art and is comparable to that serving the citizens of Duluth and other Northshore municipalities for treatment of public drinking water.

Permit Conditions

The proposed permit requires Reserve to implement best available technology and establishes limitations and operating conditions which include requiring that Reserve operate the water filtration plant as efficiently as possible and assure that water quality is maintained for the Beaver River. The permit includes effluent limitations and water quality standards for amphibole fibers, fluoride, total suspended solids, turbidity, pH and dissolved iron. The permit also establishes a monitoring program to determine compliance with these conditions. The permit requires that backwash from the filter plant be returned to the Mile Post 7 basin.

Location of the water filtration plant is shown on the attached map.



-3pn-

Date: APR 27 1984

Permit No: MN 0055301

-4pn- Date: APR 27 1984

Permit No: MN 0055301

On the basis of preliminary MPCA staff review and application of applicable standards and rules, the Director will recommend that the MPCA issue a permit for construction and discharge subject to certain effluent limitations, water quality standards and special conditions. Any construction that may be required in the proposed permit may not be commenced until the permit is issued and the plans and specifications are approved by the Director. Because of the need to construct this facility this summer, and because of the interest in permits issued to Reserve Mining Company in the past, the MPCA staff has endeavored to contact many of the persons or/organizations which have expressed an interest in permits issued to Reserve, prior to this public notice. Consequently, these persons have had an opportunity to review and comment on the draft permit.

The proposed determination to recommend issuance of the permit is preliminary. Interested persons are invited to submit written comments upon the proposed discharge. Interested persons may also petition for a public hearing in accordance with 6 MCAR § 4.4011. Comments or petitions for public hearings should be submitted in person or by mail no later than thirty (30) days after the public notice of this application is issued. Written comments or petitions for public hearing should be addressed to:

Permits Section
Division of Water Quality
Minnesota Pollution Control Agency
1935 West County Road B 2
Roseville, Minnesota 55113

However, because of the time constraints, we ask that anyone interested in commenting also verbally communicate comments to the person listed below. We would appreciate verbal comments approximately 10 days prior to the close of the notice so we may begin to understand the interest in this proposed permit prior to close of the notice.

To ensure that comments are clearly directed to the proposed permit and to appropriate staff persons, the permit number should appear on each page of any submitted comments. All comments received no later than thirty (30) days after this public notice is issued will be considered in the formulation of final determinations. The MPCA will make final determinations in a timely manner after the expiration of the public comment period. Requests for a public hearing must be in conformance with 6 MCAR 4.4011 and/or 4.4013.

Public notice of the plans and specifications is discretionary with the Director, but in all cases a letter notice will be sent to all persons who indicate an interest in the plans and specifications.

The application, proposed permit including proposed effluent limitations, special conditions, comments received, pertinent rules and other documents relevant to the permit are available for inspection and may be copied anytime between 9:30 A.M. and 3:30 P.M., Monday through Friday. Copies of the public notice and fact sheet, are available at the address shown above. If you have any questions regarding this draft permit, or are interested in knowing when this permit will be presented to the MPCA Board, please contact Robert Criswell at (612) 296-7252.

Please bring the foregoing to the attention of persons whom you know would be

DRAFT

AUTHORIZATION TO DISCHARGE AND TO CONSTRUCT WASTEWATER TREATMENT FACILITIES UNDER THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM AND STATE DISPOSAL SYSTEM PERMIT PROGRAM

In compliance with the provisions of the Federal Water Pollution Control Act, as amended,. (33 U.S.C. 1251 et seq; hereinafter the "Act"), Minnesota Statutes Chapters 115 and 116, as amended, and Title 6, Part 4.4001 - 4.4021 and 4.4101 - 4.4111 of the Minnesota Code of Agency Rules (hereinafter 6 MCAR § 4.4001 et. seq. and 4.4101 et. seq.)

RESERVE MINING COMPANY; ARMCO INC.; AND REPUBLIC STEEL CORPORATION

herein after referred to as the Permittee, are authorized by the Minnesota Pollution Control Agency (MPCA), to construct wastewater treatment facilities and/or to discharge from The Mile Post 7 return water filtration plant near Silver Bay to receiving water named the Beaver River, in accordance with effluent limitations, monitoring requirements and other conditions set forth in PARTS I and II hereof.

This permit shall become effective on the date of issuance by the Director.

This permit and the authorization to discharge shall expire at midnight, May 31, 1989. The Permittee is not authorized to discharge after the above date of expiration. In order to receive authorization to discharge beyond the above date of expiration, the Permittee shall submit such information and forms as are required by the Agency no later than 180 days prior to the above date of expiration pursuant to 6 MCAR § 4.4001 et. seq. and 4.4101 et. seq, or any amendments thereto.

Date:

Sandra S. Gardebring
Executive Director
Minnesota Pollution Control Agency

Part I

A. Description

The discharge from the wastewater treatment facilities will consist of treated tailings supernatant and surface water runoff from the Mile Post 7 tailings disposal system return water pond. The treatment facilities are designed for a flow rate of 2500 gallons per minute. It is possible that the facilities could occasionally discharge at a maximum rate up to approximately 3500 gallons per minute.

The discharge from this facility is only necessary to reduce water levels in the Mile Post 7 tailings disposal basin to normal operating levels. Normal operating levels are considered to be an average basin level of twenty feet although the normal operating levels may vary depending on tailings deposition and submersion.

The wastewater treatment facilities consist of alum addition using a rapid mix system, flocculation basin, multi-media filtration beds, alum tank, polymer tank, pumps, pipes, and appurtenances. These facilities are generally described in a report titled Report on Mile Post 7 Tailings Diposal System Excess Water Discharge by RREM, Inc. dated March, 1984. This report further establishes the basin design criteria which were utilized. Final plans and specifications for the facility will be reviewed in accordance with Part II,A.8.

PART I

B. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning upon completion of construction of the wastewater treatment facilities described in Part I.A., of this permit and lasting until May 31, 1989 the Permittee is authorized* to discharge from outfall serial number 20100.

Such discharges shall be limited and monitored by the Permittee as specified below:

EFFLUENT CHARACTERISTICS	DISCHARGE LIMITATIONS kg/day (lbs/day)		Other Units (specify)		MONITORING REQUIREMENTS	
	Thirty (30) Consecutive Day Average	Daily Max	Thirty (30) Consecutive Day Average	Daily Max	Measurement Frequency	Sample Type
Flow-m^3/Day (MGD)	-	-	-	-	-	Daily Average Flow Estimate
Turbidity (NTU)**	-	-	-	-	Continuous	-
Total Amphibole Fibers***	-	-	$10x10^6$	$15x10^6$	Twice/week	Grab
Fluoride****	-	-	-	-	-	Grab
Total Suspended Solids	-	-	20 mg/l	30 mg/l	Twice/month	Grab
Dissolved Iron	-	-	1.0 mg/l	2.0 mg/l	Once/month	Grab
					Once/month	Grab

The pH shall not be less than 6.5 nor greater than 8.5 and shall be monitored twice/week by grab sample. These upper and lower limitations are not subject to averaging and shall be met at all times.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

The discharge shall not contain oil or other substances in amounts sufficient to create a visible color film on the surface of the receiving waters.

Except for turbidity and fluoride or unless otherwise specified in the permit or monitoring plan, samples taken in compliance with the monitoring requirements specified above shall be taken at a point representative of the discharge from the wastewater treatment facilities to the Beaver River. Turbidity samples shall be taken from the discharge from each filter bed prior to mixing with any other filtered waters by continuous sampling. Fluoride samples may be taken at the point of entry of the discharge to the Beaver Bay.

*See Part I,C.4. Discharge Authorization.
**See Part I,C.5. Turbidity Operational Levels.
***See Part I,C.6. Total Amphibole Fiber Effluent Limitations and Part I,C.7. Fiber Monitoring.
****See Part I,C.8. Fluoride Water Quality.

PART I

C. Other Requirements

1. Tailings Deposition

This permit does not authorize the discharge or disposal of tailings.

2. Non-Degradation

Consistent with Minnesota Rule 7050.0180, the wastewater treatment facilities shall be operated and maintained by the Permittee to ensure to the maximum practicable extent that the surface waters of the State are maintained at their natural quality. The increase in surface water of any pollutant shall not preclude the appropriate beneficial present and future use of the water.

3. Treatment Technology

The Permittee shall be required to apply the best available technology to maintain water quality and shall comply with all applicable laws, rules, court orders, and decisions specifically including Minnesota Rules 7050.0100 - 7050.0220 and 7050.0300 - 7050.0350 and other duly adopted rules and standards which now or in the future may be applied to the Permittee's wastewater treatment facilities during construction and operation.

4. Discharge Authorization

Consistent with 40 CFR Part 440.12 a.3. Ore Mining and Dressing Point Surce Category, Subpart A, Iron Ore Subcategory; or any amendments thereto; the Permittee's total discharge from the Mile Post 7 tailings disposal basin shall be limited to the amount of precipitation drainage which has accumulated in the basin. The total amount of precipitation drainage shall be calculated by adding the amounts of precipitation drainage determined in items a & b below:

a. The quantity of precipitation drainage accumulating in the Mile Post 7 basin from the drainage area flowing to the Mile Post 7 basin, but not including the Mile Post 7 basin area; times the total annual precipitation.

b. The quantity of precipitation drainage accumulating in the Mile Post 7 basin from the annual precipitation minus the annual evaporation, times the area of the Mile Post 7 basin.

In addition, the Permittee shall maintain water levels in the Mile Post 7 tailings basin, such that, to the maximum practicable extent, all tailings are placed underwater in the basin during operations. At the present time the normal average basin water level, which is maintained to assure the tailings are disposed of under water, is approximately twenty feet.

based on bkgd

5. Turbidity Operational Level(s)

The Permittee shall determine what level of turbidity in the treated water from each filter bed will assure compliance with fiber effluent limitations contained in Part I.B.1, of this permit. Upon determining the appropriate turbidity operational level(s), the Permittee may, upon approval of the Director, reduce the fiber monitoring frequency as described in Part I,C.7. Fiber Monitoring, provided the Permittee can consistently comply with the appropriately determined turbidity levels. Non-compliance with the determined turbidity levels may be just cause for requiring additional fiber monitoring.

6. Total Amphibole Fiber Effluent Limitations

The Permittee shall comply with the total amphibole fiber effluent limitations described in Part I,B. of this permit, for ninety-five percent of the samples collected. Compliance shall be determined based on the fiber sampling and analysis required by Part I,C.7. of this permit or samples taken by the Agency and analyzed in accordance with the procedures described in Part I,C.7. of this permit.

7. Fiber Monitoring

a. Analyses Procedures Applicable to Part I,B.

Fiber analyses of samples taken pursuant to Part I,B. of this permit shall be quantitiative including fiber concentrations as amphibole, chrysotile, non-amphibole, non-chrysotile, ambiguous, etc. and shall also include a mineralogical breakdown of the fibers found and their concentrations. Analyses required by this permit shall be performed in accordance with the most recent techniques of the Minnesota Department of Health and shall be conducted by the Minnesota Department of Health. A one liter sample shall be utilized for all water quality and effluent sampling.

This permit does not require that the Permittee analyze samples for fibers nor preclude such analysis by the Permittee utilizing techniques of its own choice. Nothing herein shall be considered a waiver by the Permittee of its right to contest data or conclusions derived from the analytical methods acceptable to the Minnesota Department of Health and the Agency.

b. Permittee Payment for Monitoring and Fiber Sample Analyses

Reasonable costs related to monitoring and fiber analyses required by Part I, B. of this permit shall be borne by the Permittee.

c. Fiber Monitoring Frequency

The Permittee, in accordance with the requirements contained in Part I,D.2. Monitoring Plan, shall submit a fiber monitoring plan which, at a minimum includes the following:

1. A fiber monitoring plan for the initial operating "start-up" period for the treatment facilities requiring a minimum level of fiber sampling of once per week.

2. A fiber monitoring plan to follow the initial operational "start-up" period for the treatment facilities which is designed to determine operational turbidity levels to meet the required amphibole fiber limitations. The fiber monitoring frequency during this period will be a minimum of twice/week and the period will be a minimum of approximately six weeks. If an appropriate turbidity level can not be established the Permittee shall continue to monitor fibers at a frequency of twice/week.

3. Provided an appropriate turbidity operational level for the filter beds can be established as described in Part I,C.5., the fiber monitoring required by Part I,C.7.c.2. may be reduced to once per month. Based on a consistent compliance with the fiber effluent limitations described in Part I,B. of this permit, after a period of 6 months at a monitoring frequency of once per month, the Permittee may request a further reduction in monitoring for fibers pursuant to Part I,D.1.f. With adequate justification for a reduction in monitoring, a fiber monitoring frequency of once/quarter is envisioned after the period of monthly analysis. Approval of a request for reduction in monitoring pursuant to Part I,D.1.f. shall not be unreasonably withheld.

8. Fluoride Water Quality

The Permittee shall establish a flow monitoring station in the Beaver River, utilizing a staff guage and appropriate river cross-sections, to determine appropriate discharge flowrates which, after mixing with the Beaver River, assure compliance with the 1.5 mg/l water quality standard for fluoride. In addition, based on the effluent monitoring done for fluoride, required by Part I,B. of this permit, and a mass balance of the fluoride loading to the river, the Permittee shall prepare an operational plan for adjusting discharge flowrate to assure compliance with the 1.5 mg/l fluoride standard. This plan shall include a graph or some other appropriate or similar means for correlating the discharge loading rate of fluoride with flow in the Beaver River at the appropriate guaging station.

During periods of low flow the Permittee shall monitor the mixing zone for fluoride at the beginning of the mixing zone and at the point of the proposed guaging station to determine the effectiveness of mixing;

9. Filter Backwash and Removed Substances

The Permittee shall dispose of all filter backwash for the treatment facilities within the Mile Post 7 Tailings Disposal Basin. Consistent with Part II,A.6. the Permittee shall submit a plan for disposal of removed substances within 90 days after the effective date of this permit.

10. Polychlorinated Biphenyl Compounds

The Permittee shall not discharge polychlorinated biphenyl compounds including, but not limited to, those commonly used in electrical transmission components.

11. Water Treatment Additives

There shall be no use of water treatment additives other than those reported on the application for this permit, nor any significant increase in the amount of any treatment additive used, without prior approval of the Director. In requesting approval to use a water treatment additive, the Permittee shall provide the Director (Attn: Permits Section) with the commercial name of the product to be used, the amount or concentration to be used, and the frequency of usage proposed. This permit may be reasonably modified to restrict the usage or discharge of a treatment additive or to require additional effluent monitoring.

12. Reopening Clause

This permit shall be modified, or alternatively, revoked and reissued, to comply with any applicable effluent standards or limitation promulgated or approved under section 301 (b)(2)(c), and (d), 304 (b)(2), and 307 (a)(2) of the Clean Water Act, if the effluent standard or limitation so promulgated or approved:

(1) Contains different conditions or is otherwise more stringent than any effluent limitation in the permit; or

(2) Controls any pollutant not limited in the permit.

D. MONITORING AND REPORTING

1. Monitoring

a. Representative Sampling
Samples shall be taken at a point representative of the discharge. Any monitoring measurements taken as required herein shall be representative of the volume and nature of that which is being discharged.

b. Quality Assurance
In order to insure the validity of analytical data, the Permittee shall submit an outline of the quality assurance program employed by the laboratory performing the analyses. Such outline shall be contained in the monitoring plan required by PART I, D.2.

c. Test Procedures
Test procedures for the analysis of pollutants shall conform to regulations promulgated pursuant to Section 304 (h) of the Act, and Minnesota Statutes, Section 115.03, Subd. 1 (e) (7) as amended or as otherwise specified in this permit.

The Permittee shall periodically calibrate and perform maintenance on all monitoring and analytical instrumentation used to monitor pollutants discharged under this permit, at intervals to insure accuracy of measurements. The Permittee shall maintain written records of all such calibrations and maintenance.

d. Recording of Results
For each measurement taken or sample collected pursuant to the requirements of this permit, the Permittee shall record the following information:

1) The exact place, date, and time of sampling;
2) the dates the analyses were performed;
3) the person who performed the analyses;
4) the analytical techniques, procedures or methods used; and
5) the results of such analyses.

e. Additional Monitoring by Permittee
If the Permittee monitors any pollutant designated herein more frequently than required by this permit, or as otherwise directed by the Agency or Director, the results of such monitoring when done in conformance with procedures and at the locations described in the approved Monitoring Plan required in Part I,D.2. of this permit, shall be included in the calculation and reporting of values submitted on the Discharge Monitoring Report Form. Any increased monitoring frequency above that

f. Reduction of Monitoring

If the Permittee, after monitoring for a reasonable period of time, finds that it is consistently meeting the terms and conditions of this permit, the Permittee may request a reduction or elimination of specific monitoring requirements. The Permittee shall provide to the Director appropriate justification as the basis for its request. The Director, after review of the Permittee's request, may authorize a reduction or elimination of the specified monitoring requirements.

g. Recording and Records Retention

All sampling and analytical records required by this permit shall be retained by the Permittee for a minimum of three (3) years. The Permittee shall also retain all original recordings from any continuous monitoring instrumentation, and any calibration and maintenance records, for a minimum of three (3) years. These retention periods shall be automatically extended during the course of any legal or administrative proceedings or when so requested by the Regional Administrator, the Agency, or the Director.

2. Monitoring Plan

a. The Permittee shall submit a monitoring plan to the Director for approval by October 15, 1984. At a minimum the monitoring plan shall include:

1. a description of the monitoring equipment;

2. the monitoring methods;

3. the type of sample;

4. sampling procedures or manner and analysis of samples;

5. location and interval of sampling; and

6. such other information appropriate and necessary to the monitoring plan as the Director may reasonably require.

3. Reporting

a. All monitoring results obtained pursuant to the provisions of this permit shall be summarized on a monthly basis and reported on the designated "Discharge Monitoring Report Form."

b. Reports shall be submitted monthly and received or postmarked no later than the 21st day of the month following the completed reporting period. A reasonable alternative reporting date or submittal procedure may be established for data related to monitoring fibers. The first report is due on the reporting date following the first reporting period where monitoring is required beginning on the date of issuance of this permit. If the reporting period specified above is quarterly, reports shall be due on the 21st day of April, July, October, and January. Signed copies of these, and all other reports required herein, shall be submitted to the Director at the following address:

Minnesota Pollution Control Agency
Division of Water Quality
Enforcement Section
1935 West County Road B-2
Roseville, Minnesota 55113

c. The Permittee shall report the results of the monitoring in the units specified in this permit. The reports or written statements shall be submitted even if no discharge occurred during the reporting period. The report shall include (1) a description of any modifications in the wastewater collection, treatment, and disposal facilities; (2) any substantial changes in operational procedures; (3) any other significant activities which alter the nature or frequency of the discharge or water quality; (4) any other material factors affecting compliance with the conditions of this permit and such information as the Agency or Director may reasonably require of the Permittee pursuant to Agency Regulation, 6MCAR 4.4015 B. and 4.4109 E. and Minnesota Statutes, Chapters 115 and 116 as amended.

d. Except for data determined to be confidential under Section 308 of the Act, and Minnesota Statutes, Section 116.075, Subd. 2, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the Agency. Procedures for submitting such confidential material shall be pursuant to Minnesota Rule 7000.1300. As provided in the Act, effluent data shall not be considered confidential. Knowingly making any false statement on any such report, confidential or otherwise, is subject to the imposition of criminal penalties as provided for in Section 309 of the Act and Minnesota Statutes, Section 115.071 Subd. 2 (b).

E. DEFINITIONS

1. The "Agency" means the Minnesota Pollution Control Agency, as constituted pursuant to Minnesota Statutes, Section 116.02, Subd. 1.

2. The "Director" means the Executive Director, or other Agency staff as authorized by the Executive Director, of the Minnesota Pollution Control Agency as described in Minnesota Statutes, Section 116.03 as amended.

3. The "Regional Administrator" means the Environmental Protection Agency (EPA) Regional Administrator for the region in which Minnesota is located (now Region V).

4. The "Act" means the Federal Water Pollution Control Act, as amended 33 U.S.C. 1251, et seq.

5. A "Composite" sample, for the purpose of the monitoring requirements of this permit, is defined as no less than a series of three flow proportioned grab samples collected in a twenty-four hour period. The interval between samples shall be no less than one hour.

6. "Thirty (30) Consecutive Day Average" for the purposes of this permit shall be a monthly average.

   a. Weight Basis - The "thirty (30) consecutive day average" discharge is defined as the summation of the measured daily discharges by weight divided by the number of days during the calendar month.

   b. Concentration Basis - The "thirty (30) consecutive day average" concentration, other than for fecal coliform group organisms, is defined as the arithmetic average (weighted by flow value) of all the daily determinations of concentration made during the calendar month. Daily determinations of concentration made using a composite sample shall be the concentration of the composite sample. When grab samples are used, the daily determination of concentration shall be the arithmetic average (weighted by flow value) of all the samples collected during the calendar day.

      The "thirty (30) consecutive day average" for fecal coliform group organisms is defined as the geometric mean of samples collected in a calendar month.

7. "Daily Maximum" Discharge

   a. Weight Basis - The "daily maximum" discharge means the total discharge by weight during any calendar day.

   b. Concentration Basis - The "daily maximum" concentration means the daily determination of concentration for any calendar day.

8. The "Seven (7) Consecutive Day Average" concentration, other than for fecal coliform group organisms, is defined as the arithmetic mean of the samples collected in a period of seven (7) consecutive days. The seven (7) consecutive day average for fecal coliform group organisms is defined as the geometric mean of samples collected in a period of seven (7) consecutive days.

9. Pollutants, Toxic Pollutants, Other Wastes, Point Source, Disposal System, Waters of the State, and other terms for the purpose of this permit are defined in Section 502 of the Act and Minnesota Statutes 115.01 and 116.01 as amended and Agency Regulation 6MCAR 4.4103.

10. "Fibers", for the purpose of this permit, are defined as chrysotile and amphibole mineral particles with 3 to 1 or greater aspect ratios.

11. "Amphibole" is a group of hydrated silicate minerals usually containing two or more metals such as iron, magnesium and/or calcium. Amphibole minerals share a common crystalline structure with a double chain of linked silica tetrahedra.

12. "Chrysotile" is a fibrous magnesium silicate mineral in the serpentine group with a characteristic scroll-like struture which often gives the unit fibers a hollow tube appearance.

PART II

A. MANAGEMENT REQUIREMENTS

1. Non-Compliance and Bypass Notification

If, for any reason, the Permittee exceeds any effluent limitation specified in the permit, bypasses, or causes a diversion of wastewater or unauthorized discharge in violation of this permit, the Permittee shall notify the Director as follows:

a. Telephone Communication
Report immediately to the Enforcement Section, Division of Water Quality (612) 296-7373 any of the following occurrance:

(1) a bypass or violation of permit conditions or limitations which may cause a nuisance or be a hazard to human health or welfare or the environment;

(2) an unauthorized discharge (whether accidental or not) of oil, toxic pollutants, or hazardous waste;

(3) a violation of an effluent limitation for a toxic pollutant listed pursuant to Section 307(a) of the Act.

The Permittee shall immediately recover as rapidly and thoroughly as possible such discharged substance(s) and take such other action as may be reasonable to minimize or abate pollution of the waters of the State. This shall be followed by a written explanation on the discharge monitoring report.

b. Prior Approval
If, for any reason, a major treatment unit must be bypassed for routine maintenance, and this bypass will result in a degradation of the effluent, the Director (Attn: Enforcement Section [(612) 296-7236)] must be notified and grant approval prior to removing this unit from service. In the case of emergency maintenance, the Director shall be informed of the circumstances surrounding the need for emergency maintenance and the action taken.

c. Written Report
Report on the Discharge Monitoring Report: any violation of daily minimum, maximum, seven (7) day average, or thirty (30) day average effluent limitation; any violation of water quality limitations of this permit; and any bypass that did not present a nuisance or health hazard; or have substantial environmental effects.

Written notification required above shall contain the following information:

(1) A description of the discharge, approximate volume, and cause of non-compliance or bypass.

(2) The period of non-compliance or bypass including exact dates and times; or if not corrected, the anticipated time the incident is expected to continue; and steps taken to correct, reduce, eliminate and prevent recurence of the non-compliance.

2. Bypassing

The diversion or bypass of any discharge from the collection system or treatment facility by the Permittee is prohibited, except: (a) where unavoidable to prevent loss of life or severe property damage; or (b) where excessive storm drainage or runoff would damage any facilities necessary for compliance with the terms and conditions of this permit; or (c) where emergency maintenance must be performed; or (d) where routine maintenance must be performed on a major treatment unit and prior approval has been received from the Director. Provision (c) does not authorize discharges caused by a failure to perform routine or preventive maintenance or by a failure to maintain system reliability in accordance with PART II, A.7. of this permit.

3. Adverse Impact

The Permittee shall take all reasonable steps to minimize any adverse impact to waters of the State resulting from:

a. all unauthorized discharges accidental or otherwise, of oil, toxic pollutants or other hazardous substances;
b. limitation violations or;
c. a bypass.

4. Change in Discharge

a. All discharges authorized herein shall be consistent with the terms and conditions of this permit. The discharge of any pollutant more frequently than, or at a level in excess of, that identified and authorized by this permit shall constitute a violation of the terms and conditions of this permit. Such a violation may result in the imposition of civil or criminal penalties as provided for in Section 309 of the Act and Minnesota Statutes Section 115.071.

b. Facility modifications, additions, and/or expansions that increase the plant capacity shall be reported to the Director, (Attn: Enforcement Section, Division of Water Quality) and this permit may then be modified or reissued to reflect such changes.

c. Any anticipated change in the facility discharge, including significant new or modified industrial discharge(s) or significant change in the quality of existing industrial discharges to the treatment system that may result in a new or increased discharge of pollutants shall be reported to the Director, (Attn: Enforcement Section, Division of Water Quality). Modification to the permit may then be made to reflect any necessary change in permit conditions, including any necessary effleunt limitations for any pollutant not identified and limited herein.

d. In no case are any new connections, increased flows, or significant changes in treatment system influent quality permitted that will cause violation of the effluent limitations specified herein.

5. Facilities Operation and Quality Control

All waste collection, control, treatment, and disposal facilities shall be operated in a manner consistent with the following:

a. Maintenance of the treatment facility which could result in degradation of effluent quality shall be scheduled as much as possible during non-critical water quality periods and shall be carried out in a manner approved by the Director. Such approval shall not be unreasonably withheld.

b. The Director may require the Permittee to submit a maintenance plan to eliminate degradation of the effluent. The Permittee shall operate the disposal system in accordance with this plan as approved by the Director.

c. The Permittee shall provide an adequate operating staff which is duly qualified under 6 MCAR 5.003, if applicable as determined by the Director, pursuant to Agency Regulation 6MCAR 4.4015 C.6., to carry out the operation, maintenance and testing functions required to insure compliance with the conditions of this permit.

d. The Permittee shall at all times maintain in good working order and operate as efficiently as possible all facilities or systems of control installed or used to achieve compliance with the terms and conditions of this permit.

e. Necessary in-plant control tests shall be conducted at a frequency adequate to ensure continuous efficient operation of the treatment facility.

f. Consistent with 40 CFR Part 122.29(d)(4) the Director shall take into consideration the variation of treatment during "start-up" of the new wastewater treatment facilities. The "start-up" period shall begin on the date of commencement of the first discharge and shall be completed in the shortest feasible time after that date, not to exceed ninety-days. This condition shall not be construed as limiting the Director from requiring the Permittee to take appropriate and necessary actions to comply with the terms and conditions of this permit during the start-up period.

6. Removed Substances

The Permittee shall dispose of solids, sludges, filter backwash, or other pollutants removed from or resulting from treatment or control of wastewaters in such manner as to prevent any pollutant from such materials from entering waters of the State. The Permittee, in disposal of such materials shall comply with all applicable water, air, and solid waste statutes, rules and regulations. When requested, the Permittee shall submit a plan for such disposal for approval by the Director.

7. System Reliability

The Permittee is responsible for maintaining adequate safeguards to prevent the discharge of untreated or inadequately treated wastes at all times. The Permittee is responsible for insuring system reliability by means of alternate power sources, back-up systems, storage of inadequately treated effluent, or other appropriate methods of maintaining system reliability.

8. Construction

This permit only authorizes the construction of treatment works to attain compliance with the limitations and conditions of this permit, after plans and specifications for treatment facilities have been submitted to and approved in writing by the Director prior to the start of any construction.

B. RESPONSIBILITIES

1. Transfer of Ownership or Control

No permit may be assigned or transferred by the holder without the approval of the Agency which approval shall not be unreasonably withheld. In the event of any changes in control or ownership of the facilities, a Request for Permit Transfer, signed by both parties shall be sent to the Agency, (Attn: Enforcement Section, Division of Water Quality). Any succeeding owner or controller shall also comply with the terms and conditions of this permit.

2. Permit Modification, Suspension, Revocation

After notice and opportunity for a hearing, in accordance with applicable law, this permit may be modified, revoked, reissued or suspended in whole or in part during its term for cause including, but not limited to, the following:

a. violation of any terms or conditions of this permit;
b. obtaining this permit by misrepresentation or failure to disclose fully all relevant facts upon which the permit was based;
c. any other cause listed in 40 CFR Parts 122.14, 122.15 and 122.16;
d. Agency Rule 6 MCAR 4.4001 et. seq. and 4.4101 et. seq. including other just cause such as a change in any federal or state laws, rules, or regulations or as a result of judicial determination of matters between the Agency and the Permittee or;
e. the Permittee shall be notified at least ninety (90) days in advance of the effective date of a modificiation or revocation of this permit. The Permittee shall have reasonable opportunity to respond to the notification and may petition the Agency for a hearing and the hearing shall be held pursuant to applicable regulations. At such hearing, the Permittee shall be afforded the opportunity to demonstrate corrective measures taken during said ninety (90) day period.

3. Toxic Pollutants

Notwithstanding PART II, B.2. above, if a toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is established under Section 307 (a) of the Act or Minnesota Statutes Chapters 115 and 116, as amended, for a toxic pollutant which is present in the discharge, and such standard or prohibition is applicable to this permit, this permit may be revised or modified in accordance with the toxic effluent standard or prohibition and in accordance with applicable laws and regulation.

4. Right of Entry

The Permittee shall, pursuant to Section 308 of the Act and Minnesota Statutes 115.04 and 116.091, allow the Director of the Agency, the Regional Administrator, and their authorized representatives upon presentation of credentials:

a. to enter upon the Permittee's premises where a disposal system or other point source or portion thereof is located, for the purpose of obtaining information, examination of records, conducting surveys or investigations;
b. to bring such equipment upon the Permittee's premises as is necessary to conduct such surveys and investigations;
c. to examine and copy any books, papers, records, or memoranda pertaining to the installation, maintenance, or operation of the disposal system or discharge, including but not limited to, monitoring data of the disposal system or point source, or records required to be kept under the terms and conditions of this permit;
d. to inspect any monitoring equipment or to observe monitoring procedures required in this permit; and
e. to sample water quality, any discharge of pollutants or wastewater from the disposal system, or plant operations.

Entry for the purposes indicated is subject to reasonable compliance with the Permittee's safety rules and reasonable avoidence of impairment or interference with construction and/or operation of the disposal system.

5. Civil and Criminal Liability

Nothing in this permit shall be construed to relieve the Permittee from civil or criminal penalties for non-compliance with the terms and conditions provided herein, or applicable laws or regulations.

6. Oil and Hazardous Substance Liability

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the Permittee from any responsibilities, liabilities, or penalties to which the Permittee is or may be subject to under Section 311 of the Act and Minnesota Statutes, Chapters 115 and 116 as amended.

7. Applicable Laws

Nothing in this permit shall be construed to preclude the institution of any legal or administrative proceedings or relieve the Permittee from any responsibilities, liabilities, or penalties for violation of any applicable laws, rules or regulations.

8. Property Rights

The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of federal, state, or local laws, rules, regulations, or ordinances.

9. Severability

The provisions of this permit shall be severable, and if any provisions of this permit, is held invalid, and the remaining provisions shall not be affected thereby.

10. Non-Compliance Determination

The Director shall give the Permittee reasonable notice of any determination by the Director that the Permittee has violated a term, condition or limiation of this permit.

11. Conditions for Reissuance

The reissuance of this permit shall be made pursuant to 6 MCAR 4.4004 C. and applicable Federal Regulations. The Permittee and Agency contemplate the use of the treatment facilities for the projected 40-year life of the Peter Mitchell Mine pursuant to appropriate permits reissued under 6 MCAR 4.4001 et. seq. and 4.4101 et. seq. and in compliance with the conditions for reissuance set forth in this paragraph.

12. Emergency Powers

Nothing in this permit shall prohibit the Agency or the Director from excercising emergency powers pursuant to Minnesota Statutes Section 116.11.

13. Other Permits and Approvals

This permit is not intended to relieve the Agency or the Permittee of any obligations, responsibilities, rights or priviledges assumed or imposed upon them arising from all previous permits issued to or related to the Permittee.

Permit No: MN 0055301

FACT SHEET

for the

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)

AND STATE DISPOSAL SYSTEM PERMIT PROGRAM

(Section 402, Federal Water Pollution Control Act, AS AMENDED, Minnesota Statutes Chapters 115 and 116 as amended and 6 MCAR 4.4001 et.seq. and 4.4101 et.seq.)

Draft NPDES and State Disposal System Permit to Construct Wastewater Treatment Facilities and/or to Discharge into Waters of the State

Permits Section
Division of Water Quality
Minnesota Pollution Control Agency
1935 West County Road B 2
Roseville, Minnesota 55113

Public Notice No: 44I-1380 Public Notice Issued On: APR 27 1984

Name and Address of Applicant:

Reserve Mining Company
Highway 61
Silver Bay, Minnesota 55614

Name and Location of Facility:

Reserve Mining Company
Highway 61
Silver Bay, Minnesota 55614

Receiving Water: Beaver River

I. Location of Proposed Facility or Existing Discharge

The above named applicant has applied for an NPDES and State Disposal System permit, which will be issued by the Minnesota Pollution Control Agency, to Reserve Mining Company and its parent companies Armco Steel, Inc. and Republic Steel Corporation for construction of a wastewater treatment facilities and/or to discharge into the Beaver River. A description and/or sketch of the location of the facility and discharge is appended as Attachment I.

II. Description of Proposed Facility or Existing Discharge

A description of the proposed facility or the existing discharge in terms of the major sections of the facility or the significant effluent parameters of the discharge is appended as Attachment II.

Date: APR 27 1984

Permit No: MN 0055301

III. Proposed Determination

A. The Minnesota Pollution Control Agency has examined the application and has made the preliminary determination to issue the permit subject to certain effluent limitations, water quality standards, and other mandatory conditions and subject to concurrence by the U.S. Environmental Protection Agency.

B. The effluent limitations in the draft permit are appended as Attachment IIIa.

C. The schedule of compliance for meeting the proposed effluent limitations is appended as Attachment IIIb.

D. The other special conditions in the draft permit may include, but are not necessarily limited to: monitoring, recording, and reporting discharges; limiting discharges of oil, hazardous substances, collected solids, visible floating solids, foams and effluent batch discharges; planning for electric power failure and spill prevention and containment; and prohibiting bypass of treatment facilities. Persons wishing further information about the special conditions may contact .

IV. Procedures for the Formulation of Final Determinations

A. Interested persons are invited to submit written comments on the proposed permit. Comments should be submitted in person or by mail no later than thirty (30) days after the public notice of this application is issued. Written comments should be addressed to:

Robert Criswell
Permits Section
Division of Water Quality
Minnesota Pollution Control Agency
1935 West County Road B 2
Roseville, Minnesota 55113

However, because of time constraints on this project we ask that anyone interested in commenting also verbally communicate comments by calling Mr. Criswell at (612)296-7252.

The application/permit number should appear on each page of any submitted comments. All comments received no later than thirty (30) days after the public notice is issued will be considered in the formulation of final determinations. The Minnesota Pollution Control Agency will issue final determinations in a timely manner after the expiration of the public comment period.

B. Any person may request a public hearing to consider the draft permit. The Agency will consider requests received no later than thirty (30) days after the public notice of this application is issued. However, if you intend to request a public hearing, because of the time constraints on this project, please notify Mr. Criswell verbally approximately 10 days in advance of the close of the public notice period. All requests for public hearings must conform to the requirements of 6 MCAR 4.4011 and/or 4.4013 which requires that requests for a public hearing should contain at least the following:

(1) The reason or reasons a public hearing is requested;

(2) The interest in or relationship of the petitioner to the application or proposed facility and/or discharge identified therein; and

(3) Specifically indicate which portion or part of the application or other NPDES form or information constitutes necessity for such public hearing.

In addition, it is recommended that the hearing request state the issues to be considered at the hearing and the requester's position on each issue. If the Agency determines that there is grounds for holding a public hearing on the proposed permit, the Agency will then hold a public hearing to consider the issue(s). If a contested case hearing is held, the public hearing will be conducted in conformance with contested case procedures set out in 6 MCAR 4.4014 and Minnesota Rule 7000.1000. Notice of the public hearing will be prepared and circulated in conformity with Minnesota Rule 6 MCAR 4.4013 and 7000.1000 for a period of at least thirty (30) days prior to the hearing. After the public hearing, the hearing officer shall submit his/her recommendations to the Agency and the Director. The Agency Board will make the final determination. Further information regarding the conduct and nature of public hearings may be obtained by contacting the Minnesota Pollution Control Agency.

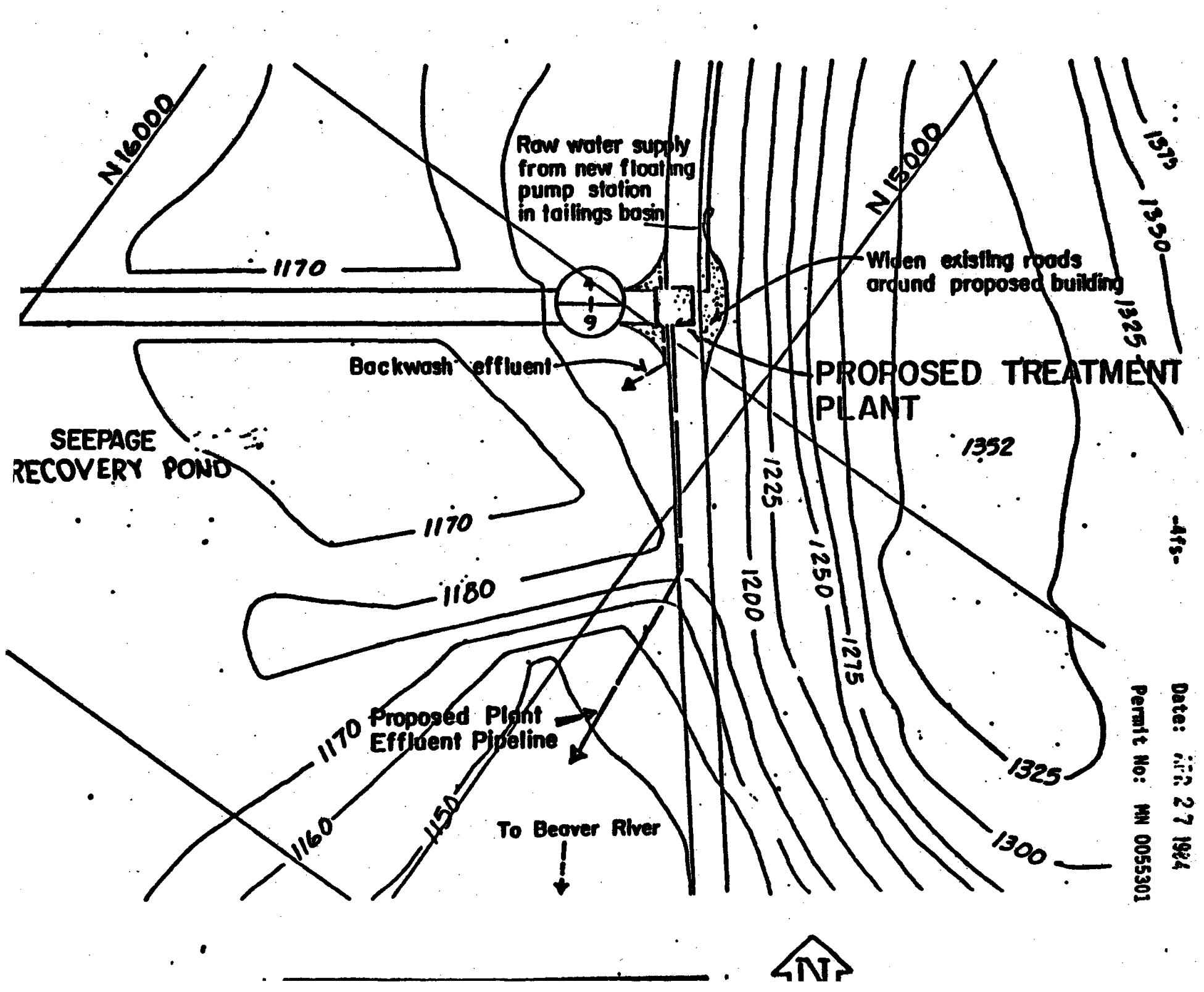
C. Persons wishing further information may contact the Minnesota Pollution Control Agency. Copies of the application draft permit including proposed effluent limitations, special conditions, comments received, other documents and related information are available for inspection and may be copied.

V. <u>Use Classification, Water Quality Standards, and Effluent Limitations</u>

A. The receiving water is classified for 1B, potable with disinfection, 2A, warm and cold water fishes and all acquatic recreation, 3B general industrial purposes with moderate treatment.

B. The following water quality standards and effluent standards and limitations were applied to the discharge:

1. Minnesota Rule 7050.0100 - 7050.0220 and 7050.0300 - 7050.0380
2. Minnesota [illegible]



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Date: [illegible] 27 1984

Permit No: MN 0055301

Date: APR 27 1984

Permit No: MN 0055301

ATTACHMENT II

Raw Wastewater Characteristics (prior to treatment)

Parameter	Average
Amphibole Fibers	377 x 10^6 fibers/liter
Turbidity (NTU)	2.3
Total Suspended Solids	2.1
Dissolved Oxygen	0.008 mgd
Fluoride	6.2 mg/l
pH range	7.53 - 8.47

ATTACHMENT IIIa

Effluent Limitations	30-DAY AVERAGE	24-HOUR MAXIMUM
Amphibole Fibers	10x10^6 fibers/liter	15x10^6 fibers/liter
Total Suspended Solids	20 mg/l	30 mg/l
Dissolved Oxygen	1 mg/l	2 mg/l
Fluoride*	-	-
Turbidity**	-	-
pH range	6.5 - 8.5	

*After mixing a water quality limitation of 1.5 mg/l shall be met.
**Monitoring will be required and a turbidity operational level will be established in the permit.

ATTACHMENT IIIb

Schedule of Compliance - a schedule of compliance is not necessary.

BEST AVAILABLE TECHNOLOGY EVALUATION OF ASBESTIFORM FIBER REMOVAL ALTERNATIVES FOR MINNESOTA POLLUTION CONTROL AGENCY

Prepared by
Black & Veatch
Engineers-Architects
Kansas City, Missouri
May 1984

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I. SUMMARY

The Reserve Mining Company constructed and placed in operation a taconite ore beneficiation tailings pond in 1980 to remove suspended materials from process wastewaters. The tailings pond was also to serve as a settled water reservoir. At production rates of 65 percent or more, the beneficiation processes require more water than the combined amounts of the water returned and the natural surface runoff from rain and snowmelt. Reduced production has created an imbalance: more water has been discharged into the tailings pond than has been required for production. This has caused the water in the pond to rise above the design level, creating a potentially unsafe situation. The problem is compounded by shortage of tailings waste solids available for dike and dam construction. Reserve Mining has therefore requested permission to discharge water from the pond. Sampling performed by the Minnesota Pollution Control Agency (MPCA) found the tailings pond water to contain 167 x 10^6 amphibole asbestos fibers per liter during a period of plant shut-down, and 377 x 10^6 amphibole fibers per liter more recently when the plant was operating. An earlier court order recognizes that a discharge may be necessary and requires that any discharge from the tailings pond first be treated using the best available technology to meet the water quality of the receiving stream. The MCPA recommends discharge limits for amphibole fiber of 15 x 10^6 fibers per liter for discharge to the Beaver River in order to maintain background water quality. Any treatment system used on the tailings pond discharge should be designed at a minimum to comply with this numerical limitation 95 percent of the time.

A thorough search of the technical literature was performed to identify and critically review water treatment technologies that have been applied to asbestiform fiber removal. Technologies that are discussed in the report include chemical coagulation and flocculation, sedimentation, diatomaceous earth filtration, and granular media (sand, dual-media, mixed-media, magnesium oxide) filtration. The assessment of technologies is that direct filtration using chemical coagulation with alum and polyelectrolyte, and granular media filtration should constitute best available technology. Although sand, dual- and mixed-media filtration can produce similar results, mixed-media filtration is recommended because of greater process stability, higher productivity (gallons of product water per run), and lesser chemical requirements. The principal process control parameter should be effluent turbidity. The treated water turbidity should ensure 95 percent compliance with the limit of 15×10^6 amphibole fibers per liter.

An opinion of installed equipment costs for a direct filtration system sized to treat a maximum flow of 3,500 gallons per minute were prepared for two alternatives: design and build the entire system, or purchase and install package treatment units. The probable installed costs for the two alternatives, at March 1984 prices (ENR Building Cost Index 2413), are approximately $2,500,000 and $1,600,000, respectively. Operation and maintenance costs, exclusive of depreciation, are expected to be approximately $280,000 per year for the design-build option and $260,000 per year for the installed package plant system.

II. INTRODUCTION

This report presents the findings of an evaluation of asbestiform fiber removal technologies and their applicability to the treatment of a proposed discharge of surface water runoff and settled ore processing wastewaters from the Reserve Mining Company's Mile Post 7 taconite tailings disposal basin. The objective of the evaluation is to identify the best available technology (BAT) which, when applied to the proposed disposal basin discharge, would maintain water quality in the proposed receiving stream (Beaver River or one of its tributaries) and ultimately Lake Superior.

To better understand the rationale behind the development of the BAT, it is helpful to have an appreciation of the source and nature of the wastes to be treated and important site-specific factors. The background of the problem leading to the proposed tailings pond discharge and the characteristics of asbestos fibers that affect their treatability are discussed in the following sections.

A. BACKGROUND

The continuing depletion of high grade iron ores, such as the hematite ore mined at the Mesabi Iron Range, led to the development and commercialization of beneficiation methods to process lower grade ores. The objectives of the beneficiation processes were to increase the iron content of the mined ore and to improve its physical properties, making the processed ore more desirable as a blast furnace feed. One such ore is taconite, a siliceous iron ore consisting chiefly of fine-grained silica mixed with magnetite and hematite. As it is mined, taconite ore contains about 25

percent iron. The beneficiation process raises the iron content to 65 percent and produces a uniform pelletized product ideal for use as a blast furnace feed.

The Reserve Mining Company, a jointly owned company of Republic Steel and Armco Steel Corporations, applied to the State of Minnesota for a permit to mine taconite at Babbitt, Minnesota, on the eastern edge of the Mesabi Iron Range, and to transport the mined taconite 47 miles by rail to a proposed beneficiation plant at Silver Bay on the shores of Lake Superior. The vast reservoir of Lake Superior was needed to meet the large water requirements of the processing technology and to provide a disposal site for the waste tailings. For each ton of processed ore pellets, up to 10,000 gallons of water is used and more than 2 tons of waste tailings are produced. Reserve Mining was granted the permits in 1948 for the requested production activities and for disposal of tailings waste into a deep trench in the bottom of Lake Superior.[1,2] The first tailings were discharged to the lake in October 1955. It is estimated that more than 60,000 tons of tailings were discharged to the lake daily.[1]

Beginning in the 1960's, concern developed about possible adverse environmental impacts of the discharge of tailings into the lake. The discovery in 1973 of high concentrations of amphibole fibers in the drinking water of communities using Lake Superior water led to a long series of court battles which culminated in agreement by Reserve Mining to discontinue the discharge of tailings wastes into Lake Superior by April 15, 1980.[3]

Reserve Mining's solution to the agreement was to construct a disposal basin at Mile Post 7 along the railroad spur between the Silver Bay plant

and the Babbitt mine. The tailings basin was designed to operate as a closed system - receiving tailings waste with a suspended solids content between 70,000 and 500,000 mg/l (98 percent of which settles out rapidly) and returning the supernatant to the beneficiation processes.[4] The size of the basin becomes apparent when it is recognized that Reserve Mining's water use was over 500,000 gpm.[3] The basin also had to have sufficient volume for snow melt and rainfall runoff.

At 65 percent of full production, the beneficiation processes consume water at rates equal to the combined flows (runoff plus process wastewater) into the basin. At production levels below 65 percent, water consumption becomes appreciably lower than the flow rates into the basin. Reduced production levels also reduce the volumes of tailings available for ongoing construction of the required dams and dikes.[5] Reductions in production levels since the tailings pond was first placed in operation have resulted in accumulation of water well beyond the design capacity of the basin. Consequently, Reserve Mining has requested a permit to treat and discharge up to 3,500 gpm of water from the Mile Post 7 return water basin. The principal pollutant in the tailings water is amphibole asbestos fibers at concentrations over 100×10^6 fibers per liter (100 MFL). Discharge of these waters as stipulated by court decision, requires treatment by the best available technology, and is contingent upon maintaining the water quality in the receiving stream (Beaver River or its tributaries) and Lake Superior. The principal parameter to be controlled is amphibole asbestos fibers. Results of MPCA tailings pond sampling program indicate that fluoride reduction may also be required before discharge.

B. ASBESTOS

Asbestos is a generic term describing a variety of naturally formed hydrated silicates that, upon mechanical processing, separate into mineral fibers. There are two principal varieties of asbestos: serpentine and amphiboles. The name, chemical composition, and variety of species of asbestos are presented in Table 1.[6] Serpentine asbestos, chrysotile, occurs under widely differing geological conditions from the amphiboles.

TABLE 1

ASBESTOS SPECIES

Species	Variety	Chemical composition
chrysotile	serpentine	$3MgO \cdot 2SiO_2 \cdot 2H_2O$
anthopyllite	amphibole	$7MgO \cdot 8SiO_2 \cdot H_2O$
amosite	amphibole	$11FeO \cdot 3MgO \cdot 16SiO_2 \cdot 2H_2O$
actinolite	amphibole	$2CaO \cdot 4MgO \cdot FeO \cdot 8SiO_2 \cdot H_2O$
tremolite	amphibole	$2CaO \cdot 5MgO \cdot 8SiO_2 \cdot H_2O$
crocidolite	amphibole	$Na_2O \cdot Fe_2O_3 \cdot 3FeO \cdot 8SiO_2 \cdot H_2O$

Chrysotile accounts for 95 percent of the world's asbestos and is the most common form of asbestos found in aquatic environments.[7] The majority of chrysotile fibers found in surface waters are less than 5 microns (5×10^{-6} meters) in length and about 0.1 micron in diameter, which places them in a size range between bacteria and viruses.[8] Chrysotile fibers have a positive surface charge at neutral pH, with an isolectric point (pH of zero surface charge, where surface charge shifts from positive to negative) of 11.8.

Although chrysotile is a distinct mineral, the five amphibole minerals listed in Table 1 are varieties of other minerals. The structure of all amphiboles consists of two chains based on Si_4O_{11} units separated by a band of cations. Seven cations form the base unit, with two hydroxyl groups attached to the central cation. Amphibole fibers have an isolectric point in the pH range of 4-5. Cummingtonite (an amosite amphibole) has been identified as a contaminant in Reserve Mining's taconite ore and is the principal asbestiform to be removed from the tailings pond discharge. It has an isoelectric point between 5.2 and 6.0. Samples of Lake Superior waters were collected for experiments by Lawrence, et al.,[8] eight kilometers offshore from Silver Bay. A sample composited at depths between 15 and 50 meters was found to contain 12.3×10^6 fibers per liter (12.3 MFL). Comparison of electron diffraction patterns of these fibers with those of standard asbestos samples, showed the majority of the fibers to be cummingtonite amphibole, with the remainder being chrysotile.

The focus of development of BAT for Reserve Mining's proposed discharge will therefore be effective removal of amphibole asbestos fibers. In fact, a recent recommendation for effluent amphibole fiber limitations for the proposed Mile Post 7 tailings basin discharge are 15 MFL to Beaver River or its tributaries and 3 MFL for discharge directly to Lake Superior. Reserve Mining has indicated its intent to discharge treated tailings pond water to Beaver River. Therefore, future references will reflect the 15 MFL standard. Any treatment system should achieve 95 percent compliance with this limitation, (i.e., fiber levels in 95 percent of all treated samples should be at or below these limits.[9]

III. TREATMENT TECHNOLOGY REVIEW - BAT DEVELOPMENT

Treatment of Reserve Mining's proposed tailing pond discharge will require a technology capable of accommodating hydraulic loads up to 3,500 gpm and long-term average hydraulic loads of 2,500 gpm. Samples collected from the tailings pond recovery basin by MPCA personnel in October 1983, when the plant was not in operation, contained total amphibole concentrations varying from 123 to 205 MFL, with an average of 167 MFL. Samples taken from the tailings pond recovery basin by MPCA personnel in February 1981, while the plant was in operation, contained amphibole fiber concentrations from 333 to 416 MFL, with an average of 377 MFL. Preliminary indications are that the upper limit of treated water amphibole fiber content consistent with maintaining water quality in the Beaver River or its tributaries is 15 MFL.

Reserve Mining has been required by the courts to apply the BAT to any discharges from the tailings basin, to assure compliance with water quality in the receiving stream. As presented in the U. S. Environmental Protection Agency Development Document for Effluent Limitation Guidelines and Standards for the Leather Tanning and Finishing Point Source Category, "The BAT technology is defined as those process control technologies which at the pilot plant, semi-works and other levels, have demonstrated sufficient technological performance and economic viability to justify investing in such facilities. BAT represents the highest degree of demonstrated control technology for plant-scale operation, up to and including 'no discharge' of pollutant when feasible."[10] BAT is being considered in this context for application to the proposed Reserve Mining Company discharge.

A review was conducted of technical literature dealing with treatment technologies that have been applied to the removal of asbestiform fibers from water or that have been applied to the removal of pollutants of similar size, shape or chemical characteristics that would be transferrable to the removal of asbestiform fibers. Treatment technologies found to be applicable include chemical coagulation and flocculation, sedimentation, and filtration. A summary of findings for each of these technologies is presented in the following sections.

A. CHEMICAL TREATMENT - COAGULATION AND FLOCCULATION

As discussed in the preceding chapter, asbestiform fibers in water carry electrical surface charges. Amphibole and chrysotile fibers carry a negative charge at pH values above 6 and 11, respectively. Because of their small size, asbestiform fibers settle very slowly, if at all. The surface charge on the small fibers further hinders settling by causing the fibers to repel each other, and prevents them from agglomerating to larger particles more susceptible to settling. Chemical coagulation destabilizes the fibers by neutralizing the electrical surface charges and, with proper choice of the coagulant, increases the probability of particles sticking together upon contact. The coagulation process is aided by rapid mixing to ensure uniform dispersion of the chemical and to promote contact between particles. Logsdon stressed the importance of close control of coagulant dosage(s) to assure thorough and complete asbestiform fiber charge destabilization before subsequent fiber removal processes.[11] Coagulation chemicals and coagulant aids that have been reported to be effective for the destabilization of amphibole and chrysotile fibers include aluminum sulfate

(alum), ferric chloride, nonionic, cationic and anionic polymers, and bentonite clay.

Alum, with or without polymer, was the coagulant recommended and used in virtually all the asbestos removal facilities reported in the literature. Schleppenbach, reporting on five years' operation of the Lakewood Filtration plant, Duluth, Minnesota, concluded that the amount of alum required for optimal coagulation depends on the raw water suspended solids concentration. The alum dose must satisfy the coagulant demands of other incoming suspended solids before asbestiform fibers are destabilized.[12] Robinson et al., reporting on alum and nonionic polymer dosage control, observed that turbidity removal is an indirect but reliable indication of fiber removal efficiency. Attempted correlations of turbidity and asbestiform fiber levels will be discussed in a later section. The optimum coagulant dosage for maximum amphibole fiber removal was found to coincide with the dosage resulting in maximum turbidity removal.[13] Overdosing of coagulants can reduce process efficiency. Figure 1 illustrates the effect of alum dosage on asbestiform fiber levels in sand filtration column effluent. Increasing alum dosage up to 50 mg/l reduced chrysotile fiber concentrations, but further increase in alum dosage reversed this trend. Figure 2 demonstrates that by increasing dosages of polyelectrolytes up to 0.5 mg/l, chrysotile fiber removals are increased; after this point the trend is reversed.[14]

Based upon the low raw water turbidities at Duluth, Robinson et al. noted that coagulant requirements appeared excessive (12-20 mg/l alum plus 0.05 mg/l nonionic polymer for amphibole removal, a minimum of 15 mg/l alum

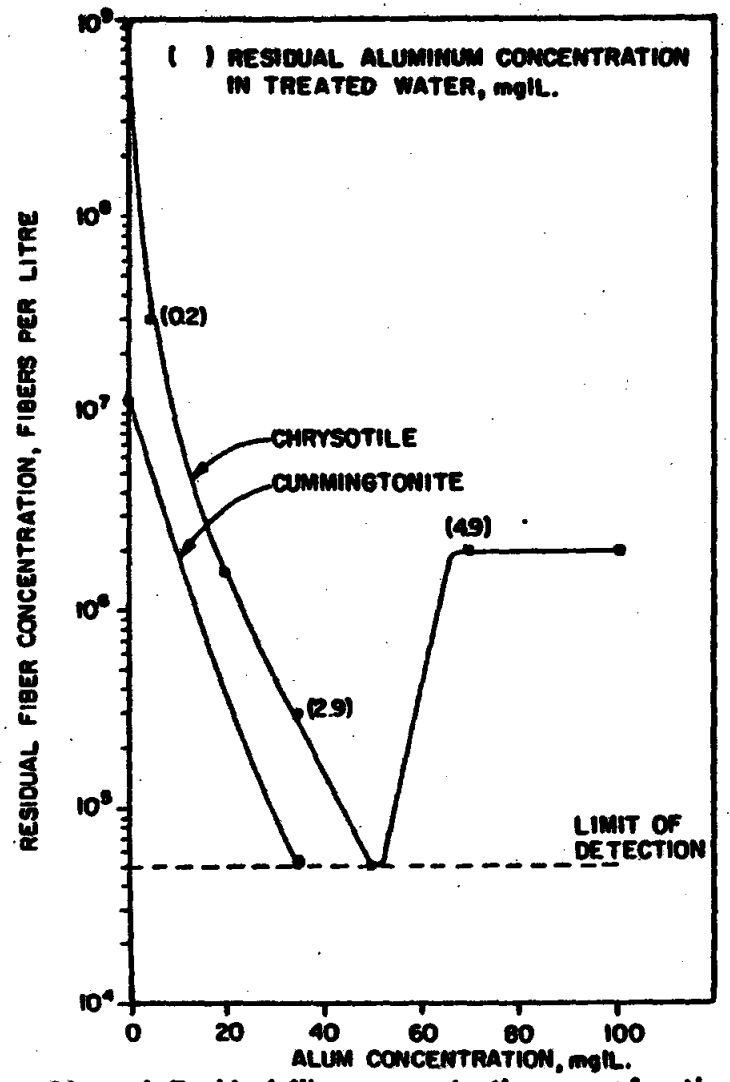

Figure 1. Residual fibre concentration as a function of alum dosage. In all cases 1 ppm WT2690 (noionic polymer)

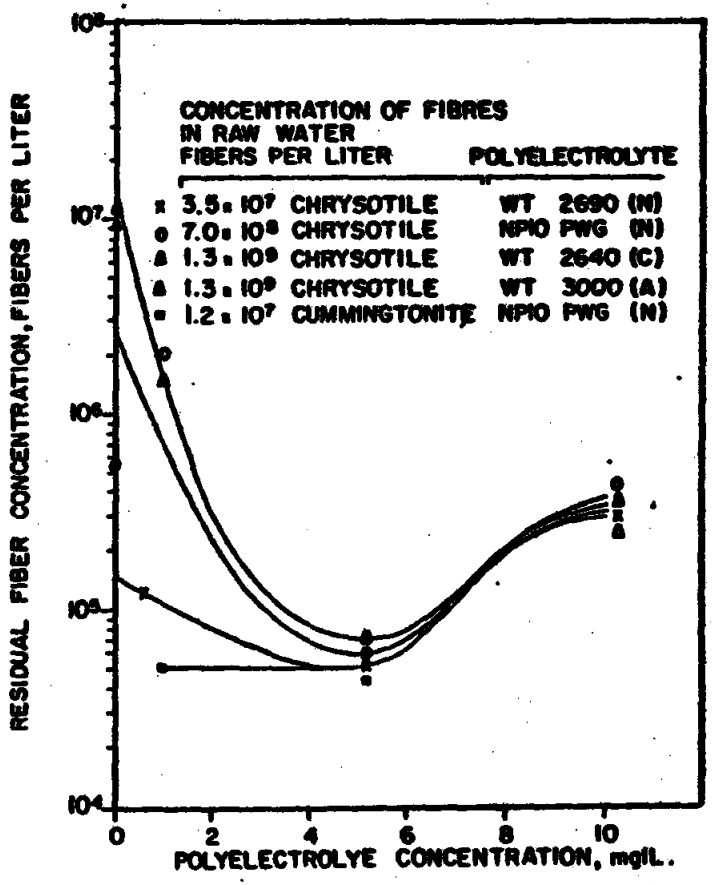

Figure 2. Residual fibre concentration as a function of polyelectrolyte additions. In all cases 35 mgIL. alum added. (14)

with anionic polymer for optimal chrysotile removal) and reasoned that high residual alum concentrations might be found in the filtered water. Analysis of 189 filtrate samples found an average residual aluminum concentration of 0.025 mg/l, indicating that the coagulant requirements are primarily the result of the asbestiform fibers in the raw water.[13] Residual aluminum concentrations shown on Figure 1 support this finding.

Logsdon et al. discussed the importance of coagulation before filtration for removal of possible contaminants such as asbestiform fibers and viruses that can be indirectly measured by a surrogate parameter -- turbidity. It has been demonstrated that proper coagulation of clear waters before filtration not only assures reduced filtrate turbidity, but also provides a superior measure of public health protection.[15]

Coagulant dosage and effectiveness also depend on subsequent treatment processes. If coagulation is followed by sedimentation, a large heavy floc is desired to allow rapid settling rates. Flocculation, a process which causes fine coagulated particles to collide and form larger floc particles, is improved through gentle agitation. If coagulation is immediately followed by filtration, a process configuration called direct filtration, a strong, small (pinpoint) floc is preferred. The ideal floc for direct filtration has sufficient toughness to resist high shear forces in the filter, occupies less volume, and allows increased filter run lengths. Based upon direct filtration pilot studies of Lake Ontario water, Tredgett concluded that chemical coagulation with approximately ten minutes contact time provided optimal turbidity removal.[16] Smaller flocs may require smaller coagulant dosages. Tests to evaluate fiber removals from the

Everett, Washington raw water supply, found that alum and lime dosages for optimal direct filtration were half the dosages required before conventional filtration (sedimentation followed by filtration).[17]

Mixing is another coagulation process design parameter whose impact has been studied and reported. There is some difference in opinion concerning the use of in-line static mixers versus propeller mixers. Tredgett and Watkins, et al., concluded that static mixers were as effective as propeller type rapid mixers in providing adequate chemical mixing.[16,17] Black & Veatch found greater resistance to turbidity breakthrough with two-stage flash mixers than with in-line mixers. Both systems were found to be more effective in terms of turbidity removal and filter run length than single-stage mixers.[18] Regardless of which is superior (a number of other factors must be considered, such as mixing time, energy input, paddle design, etc.), there are two principal factors to be targeted: (1) direct filtration requires a rapid and complete dispersion of the coagulation chemicals to assure good coagulant-particle (in this case fiber) contact and effective removal in subsequent processes; and (2) coagulants and coagulant aids should not be added simultaneously, but sequentially, with separate mixing after each addition. The Duluth Lakewood filtration plant was designed with three rapid mix chambers arranged in series. Anionic polymer is added to the first chamber, alum and caustic soda to the second, and nonionic polymer to the third chamber.[19]

B. SEDIMENTATION

Sedimentation is a water treatment process by which suspended particles heavier than water are permitted to settle out. Sedimentation process efficiency is dependent primarily upon the size and specific gravity of particles to be removed, the hydraulic detention time, and the ability to provide quiescent settling conditions.

Numerous researchers have compared the performance and suitability of direct filtration (rapid mix-coagulation-filtration) against that of conventional filtration (rapid mix-coagulation-flocculation-sedimentation-filtration). From these studies the effectiveness and need for sedimentation can be evaluated.

There are no established criteria indicating when direct filtration is more cost-effective than conventional filtration. Peterson, et al., summarized that direct filtration should be applicable to raw water with turbidity lower than 50 to 60 NTU (nephelometric turbidity units) and low in color, as long as the water is not subject to frequent algae blooms or high bacterial counts. Reporting on operating experience at Duluth, Peterson observed no significant difference in final effluent asbestiform fiber counts between direct and conventional filtration modes. Direct filtration produced an average filtrate asbestiform fiber count of 0.05 MFL versus 0.02 MFL for conventional filtration. These levels correspond to fiber removal efficiencies of 99.95 and 99.97 percent. When operating in the direct filtration mode, the filters required backwashing after 20 to 24 hours. Slightly longer filter runs were achieved when operating in the conventional mode.[20,21]

Studies for removal of chrysotile and amphibole fibers from the Everett, Washington raw water found that conventional filtration was slightly more effective in removing chrysotile fibers than direct filtration, although both modes achieved high percentage removals. Amphibole fibers were consistently removed to below 0.01 MFL by both conventional and direct filtration. The recommended process was direct filtration.[17]

Robinson et al., reporting the results of pilot plant studies at Duluth, found that slightly better turbidity removal was achieved with sedimentation. Average raw water and effluent turbidities without sedimentation were 1.65 and 0.13 NTU versus 0.79 and 0.09 NTU with sedimentation. Those tests were not run in parallel, which accounts for the difference in raw water turbidities. Analysis of filter backwash solids revealed that the solids loading to the filters was reduced by about 27 percent with sedimentation, which could be expected to increase filter run lengths by 37 percent.[13] The benefits of sedimentation would require comparison with the costs of the process.

Lawrence and Zimmerman attempted to demonstrate the efficacy of sedimentation and filtration, without chemical treatment, for the removal of chrysotile fibers in mining and asbestos processing plant effluents. Their purpose was to reduce the volume of asbestos-laden sludge from levels obtained with chemical addition. Their earlier experiments had demonstrated that sedimentation without preceding chemical addition had little effect on suspensions containing less than 10,000 MFL. Test results for the asbestos processing plant effluent showed no reduction in the 5,000 MFL raw water fiber level by sedimentation. Mixed media filtration reduced

the fiber level to 30 MFL. With asbestos mine drainage, plain sedimentation reduced fiber levels from 100,000 to 10,000 MFL and mixed media filtration reduced it further to 1,000 MFL.[7]

As discussed earlier, chemical requirements for conventional filtration of low turbidity raw waters exceed those of direct filtration. Based on the marginal benefits of increased turbidity and asbestiform fiber removal efficiencies by sedimentation ahead of filtration, the need and justification for sedimentation to treat low turbidity waters is questionable.

C. FILTRATION

Filtration has been repeatedly demonstrated to be effective in removing asbestiform fibers from water. Two types of filtering media have received considerable attention - diatomaceous earth (DE) and granular media. Results obtained with these media are summarized below.

1. DIATOMACEOUS EARTH FILTRATION. Robinson, et al, reported that both pressure and vacuum DE filtration processes were pilot tested in parallel with granular media filtration at Duluth. DE filtration tests included variation of precoat, body feed, and chemical treatment levels, and filtration rates. Tests to evaluate the precoat material included application of varying grades of DE (coarse to fine) at rates between 0.15 to 0.20 pounds per square foot of filter septum. Test results clearly showed the need for chemical pretreatment of the precoat with alum and soda ash. A medium grade DE gave best results. A fine grade DE body feed added to the raw water at a rate of 20 to 30 mg/l was also found necessary to ensure acceptable filtrate fiber levels and filter run lengths. The

recommended filtration rate was 1.0 gallon per minute per square foot (gpm/sq ft). Of 27 DE pilot runs analyzed for filtrate asbestiform, only 19 produced levels below the target value for the test program of 0.04 MFL. Vacuum filtration was not found suitable due to air bubbles released from the cold water. Sludge production from backwashing the DE filters was between 0.93 and 2.05 pounds solids per 1,000 gallons of water treated, compared with 0.03 pound per 1,000 gallons for granular media. Estimated cost for DE filtration at 30 MGD (million gallons per day) was 11 to 12 cents per 1,000 gallons of treated water versus 6.8 to 7.2 cents per 1,000 gallons for granular media filtration.[13,19,22]

Lawrence and Zimmerman evaluated the effectiveness of DE filtration in their study of asbestos mining and processing waste water treatment for asbestiform fiber removal. Direct filtration with no chemical treatment of asbestos mine drainage from Asbestos, Quebec, was evaluated. Mixed media filtration reduced the raw chrysotile fiber level from 1,000 MFL to 30 MFL (97 percent removal) while DE filtration reduced it to 3 MFL (99.7 percent) and 0.08 MFL (99.992 percent) for uncoated and coated DE, respectively. Similarly, direct filtration of Baie Vert, Newfoundland, asbestos mine drainage without chemical treatment reduced the raw water chrysotile level of 1,000 MFL to 100 MFL (90 percent) using dual media granular filtration, and to 2 MFL (99.8 percent) and less than 0.1 MFL (99.99 percent) using uncoated and coated DE filtration, respectively.[7]

2. GRANULAR MEDIA FILTRATION. With granular media filtration, particle removal takes place primarily at the filter surface in the case of single media filtration or within the filter bed for multi-media filtration. For multi-media filtration, particles are held in the filter, in

balance with the hydraulic shearing forces that tend to tear them away and carry them deeper into or through the filter. As the deposit of particles builds up, velocities through the more clogged upper layers of the filter increase, and these layers become less effective in particle removal. The burden of removal passes deeper and deeper into the filter until there is no clean media left to attain the targeted effluent quality, and the filter run is terminated. The development and use of the coarse to fine dual-media and mixed-media filters has made it possible to store large amounts of solids in the filter without excessive head loss, thereby allowing substantially longer filter runs and greater productivity[23] than with single-media surface filtration.

Studies to evaluate the capability and efficiency of sand, dual-media, and mixed-media filters for direct filtration of alum coagulated Lake Ontario water concluded that properly designed dual- or mixed-media filters afford deeper floc penetration and greater floc storage, and can accept higher applied turbidities than sand filtration.[16] The effectiveness of various types of granular media in removing asbestiform fibers was evaluated for Everett, Washington. The conclusions were that sand, dual-media (sand and coal) and mixed-media (sand, coal, and garnet) were all about equally effective in removing the fibers, although mixed-media consistently yielded the best effluent quality. The authors concluded that the filter beds should be at least 36 inches deep, composed of coal, sand, and garnet.[17]

The benefit of dual-media in reducing the rate of head loss buildup and thereby permitting longer filter runs has been well demonstrated. The ability to produce better quality filtrate with dual-media is less well

demonstrated. Roebuck, et al., compared different media during filtration of alum-treated surface water. They found that the head loss development rate for dual-media was about half that of sand, although the effluent quality was about equivalent. With a relatively weak applied floc, the breakthrough was delayed 10 to 12 hours by using 18 inches of coarse anthracite on top of 6 inches of sand, instead of 2 feet of sand or anthracite alone. The average production per run for dual-media filters was 2.5 times that of sand and the head loss was less so that the production per unit head loss was over three times that of sand. The applied loading rate for dual-media was 3.5 gpm/sq ft versus 2 gpm/sq ft for sand and the filtrate quality was virtually the same.(24)

The Duluth Lakewood Filtration Plant was designed with three mixed-media filters (16.5 inches anthracite above 9 inches of sand above 4.5 inches of ilmenite) and one dual-media filter (21 inches of anthracite above 9 inches sand), each rated at 7.5 MGD at the design loading rate of 5 gpm/sq ft. Schleppenbach, reviewing the operating records of 1977 to 1982, observed no appreciable differences in filtrate solids and asbestiform fiber levels between the two types of filters.(12) Pilot plant data for Duluth had indicated that amphibole fiber removal with mixed-media filter was better than with the dual-media filter, and mixed-media filters with two-stage flash mixing had the lowest chemical costs.(22,18) Complete removal of amphibole fibers (0.04 MFL or less retained in the filtrate) was obtained in 53 of 57 pilot plant granular filtration runs at Duluth. Chrysotile fibers were successfully removed in 10 of the 57 runs.(13) Peterson, et al., stated that the mixed-media filter was superior to the dual-media filter at Duluth because it gave longer filter runs,

shorter filter ripening time, and slightly lower filtrate turbidity. Mixed-media filtration was also found to be superior to dual-media in tolerating flow rate disturbances.[20]

Cleasby reported on comparison tests of sand, dual media, and mixed media filters loaded at a rate of 5 gpm/sq ft using water spiked with 150 mg/l mud and coagulated with 35 mg/l alum. The mixed media filter produced the lowest filtrate turbidity and longest filter runs. Dual media filtration gave the second best results, followed by sand.[53]

Conclusions drawn from a review of the reported granular media studies are that, with optimal coagulation before filtration and proper process monitoring and control, sand, dual media, and mixed media filters are all capable of reducing asbestiform fibers to the detection limit or below. Dual media and mixed media are preferred over sand because of their lower head loss development rate, higher productivity (in terms of volume filtered per filter run), lower chemical requirements, and greater stability when subjected to varying hydraulic and solids loadings. Robinson, et al., concluded, based upon 227 pilot scale granular filter runs, that for the most part the coagulant(s) used, method of coagulant addition (mixing), and the rate of filtration had a greater impact on the rate of head loss development and filter run length than did raw water turbidity, the applied asbestiform fiber level, or the filter media design.[13]

Schiller and co-workers have reported on using granular magnesium oxide as filter media for removal of asbestiform fibers and other suspended solids, applications that they have patented. Preliminary data indicate

substantial fiber reductions with no chemical pretreatment required.[25,26] Although this media may have promise, the data currently presented are too little and on too small a scale to permit reasonable projections of full scale performance.

The reported amphibole fiber removal capabilities for each of the technologies discussed are summarized in Table 2.

TABLE 2

SUMMARY OF AMPHIBOLE FIBER REMOVAL CAPABILITIES

Technology	Amphibole Fiber Removal Capability %
Chemical Coagulation and Flocculation	0
Sedimentation	
Without coagulation[7]	0*
With coagulation[13]	27
Filtration	
Diatomaceous earth (pressure filtration)[7,13]	
Uncoated precoat	99+
Coated precoat	99+
Granular media - with chemical coagulation[12,17,10,21,22]	
Sand	99+
Dual media	99+
Mixed media	99+

*Zero removal reported for feed waters containing less than 10,000 MFL
90 percent removal reported for feed waters containing more than 100,000 MFL

D. TREATED WATER MONITORING

Several studies evaluated the use of turbidity as a control parameter to monitor treated water quality, especially for asbestiform fiber levels. The most frequent conclusion was that, although fiber counts increase with increased turbidity, no meaningful correlation could be found between the

two measurements. Kermeyer observed during his asbestiform fiber removal studies for Tolt River that, when filtered water turbidity was less than 0.1 NTU, 91 percent of the samples contained amphibole fiber levels less than 0.01 MFL and 50 percent contained chrysotile fiber levels less than 0.002 MFL.(25)

Logsdon and Schleppenbach offered similar observations based on both pilot plant and full scale operations at Duluth; the concentration of amphibole fibers in the raw water was found to have little effect on plant performance. However, amphibole fibers were not effectively removed until the turbidity was removed. No meaningful correlation was found between turbidity and fiber counts for either amphibole or chrysotile fibers. None the less, amphibole fiber counts were generally less than 0.04 MFL when the filtrate turbidity was less than 0.2 NTU.(12,22)

Logsdon stressed that since turbidity and fiber count do not have a linear relationship, fiber counts can increase dramatically with only a slight increase in turbidity. This points to the need for separate turbidity monitoring of the filtrate from each filter. An example was cited of a hypothetical plant with ten filters, each producing water with 0.1 NTU turbidity and 1 MFL asbestiform content. If a turbidity rise in one filter to 0.30 NTU was accompanied with a fiber count increase to 30 MFL, the composite turbidity for the ten filters would rise to 0.12 NTU, a 20 percent increase, while the fiber count would increase to 3.9 MFL, a 290 percent increase. The need for individual fiber monitoring is clearly demonstrated, to avoid the averaging effect of composite sample monitoring.(11)

Treated water fiber levels have been demonstrated to rise rapidly when turbidity exceeds 0.2 NTU. The turbidity level necessary to assure 95 percent compliance with the proposed amphibole fiber limit of 15 MFL should be set as the treatment process control parameter. Samples should be collected periodically for electron microscopy for quantification and positive identification of treated water asbestiform levels.

E. BEST AVAILABLE TECHNOLOGY

Based upon the U.S. EPA's definition of Best Available Technology presented on page III-1 and the preceding discussion of asbestiform fiber removal technologies, the recommended BAT for treatment of the proposed Mile Post 7 tailings basin discharge is direct filtration. Coagulation using alum and polyelectrolytes followed by diatomaceous earth or granular media filtration has been clearly demonstrated to be highly effective in removing asbestiform fibers. All of these technologies have been applied at flow rates encompassing those proposed for the tailings pond discharge.

Sand, dual-media, and mixed-media filtration have all been shown to produce about equivalent effluent quality. Diatomaceous earth filtration results in substantially higher sludge volumes and has higher treatment costs than granular media filtration while effecting the same degree of removal. The greater productivity and stability of multi-media filtration, together with the lower chemical requirements and treatment cost makes this the preferred filtering media. Filter loading rates should be designed on 5 gpm/sq ft with backwashing as necessary to ensure the 95 percent compliance.

BAT limitations published for the Iron Ore Subcategory of the Ore Mining and Dressing Point Source Category allow discharge from tailings ponds only if annual precipitation exceeds annual evaporation at the particular location, such as is the case for Reserve Mining. EPA's numerical BAT limitations for an allowable tailings pond discharge are:

Pollutant	Maximum for any one day	30 day Average
Total Suspended Solids (mg/l)	30	20
Dissolved Iron (mg/l)	2	1
pH	6-9	6-9

The BAT system for asbestiform fiber removal will consistently meet these limitations.

Alum coagulation followed by granular filtration should also be capable of reducing fluoride in the tailings pond discharge. The expected degree of removal would have to be empirically determined. The 1.5 mg/l fluoride standard probably could not be met without increasing the chemical addition or adding a treatment step, such as activated alumina adsorption, following the BAT asbestiform removal.

Direct filtration could be implemented by designing and constructing the individual processes from ground up, or through the purchase of prefabricated treatment units. Brochures on suitable package systems are presented under separate cover. Inclusion of particular systems in the separate document does not imply any form of product endorsement. The brochures are solely for information.

IV. COST OPINIONS

Preliminary opinions of probable costs were prepared for the implementation of two alternative methods of BAT to treat the proposed tailings basin discharge. The two methods are design and construction of a direct filtration system, and purchase and installation of package filtration systems. Both cost opinions are based upon a design capacity of 3,500 gpm and an average operating rate of 2,500 gpm. A detailed breakdown of the cost opinions for each alternative is presented in the Appendix.

A. DESIGN AND CONSTRUCT DIRECT FILTRATION FACILITIES

The unit processes included in the design and construction alternative include raw water pumping followed by a dual-celled rapid mix unit providing 30 seconds detention time in each cell. Chemical feed systems are included to add alum to the first cell, polymer to the second, and caustic to either the first or the second cell. Flocculation tanks providing 10 minutes detention time precede mixed-media gravity filters. Filters are rated at 5 gpm/sq ft with a 30 inch media depth. Backwash water is pumped at a rate of 15 gpm/sq ft, from a finished filtered water storage tank. Facilities are provided to surface-scour the filters. The equipment will be installed in a building which will also house chemical storage facilities and a laboratory/office area. The opinion of costs also includes a pipe gallery, piping, valves, and instrumentation and control panel. Indirect costs include design engineering, construction expenses such as contractor's overhead and profit, and a contingency factor. Costing for this plant progressed along two procedures: the first was costing each unit

operation with a summation,[28] the second used a cost equation based on actual plant data, presented by Logsdon.[15] The projected costs obtained were $2,500,000 and $2,970,000, respectively. Both figures are prorated to March, 1984 dollars using the Engineering News-Record indexes.

Operation and maintenance costing includes building and process energy, maintenance materials, 24-hour operation, and chemicals based on 20 mg/l alum, 0.5 mg/l polymer, and 5 mg/l caustic feed averages. The projected average operation and maintenance cost is $280,000 annually. No depreciation has been included in this calculation, and the figure is based on March, 1984 dollars.

B. PACKAGE TREATMENT SYSTEMS

The second alternative is based on the purchase and installation of two 2.5 mgd prefabricated coagulation/flocculation/filtration units. These package treatment units permit a modular approach for maximum flexibility in response to flow quantities, and have a possible resale value in the future if increased production eliminates the need for tailings pond discharge. The costs include influent raw water pumping, the package treatment units, connection piping, a compressed air system, electrical equipment, structure concrete pads, backwash water storage, yardwork, piping, and indirect expenses consisting of engineering, construction expenses, and contingencies. The package units include the surface wash and backwash pumps and piping, complete chemical feed systems, coagulation, flocculation, mixed media filters, and shipping as part of the unit cost; the lowest priced unit was used for this cost projection. The probable installed capital investment is $1,600,000.

Operation and maintenance costs for the package units were based on the same factors as the design and construct option, also exclusive of depreciation. The package system is projected to require lower maintenance and energy costs than the designed and constructed system due to its compact design and lesser pumping requirements. The projected operation and maintenance cost for the package units is $260,000 annually.

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APPENDIX

Cost Calculations

COST CALCULATION SUMMARY

Package Treatment System

Using Trident Units. Includes:

TR420 2-3 MGD
24'10" L x 9'11" W x 10'H, each tank
Compressed air system required
Budget cost: $210,000 each (two necessary)

backwash pumps
surface wash pumps
shipping
installation and start-up
chemical feed systems

Influent pumps - minimum 20' head
Maximum flow = 3500 gpm
Cost for 3 pumps at 1750 gpm each

Assume all effluents by gravity flow, to tailings ponds
Piping to be included as a multiplier - depends on site characteristics

Clearwell-Backwash storage
Each filter is approximately 10' x 14', 4 filters total
loaded at 15 gpm/sq ft, with a 2 minute wash
Clarifier also washes, with 3,500 gal per wash cycle

Total volume per wash cycle:	clarifier	3,500
(4)(10')(14')(15 gpm/sq ft)(2)filters		16,800
		20,300 gallons

With 4 backwashes in a row = 81,200 gallons
Assume 90,000 gal tank, 35' x 35' x 10' D

Housing; assume a metal building, minimal HVAC, simple plumbing, lighting, slab on grade floor, concrete pads for units, overhead and pedestrian doors, chemical storage areas, and laboratory/office.

With 2 package units and storage: 60' x 65'

Based on purchased equipment and installation:

Multipliers: piping 21%
electrical 13%

For all PE&I and buildings: yardwork 15%

For all construction, indirect costs:

engineering	10%
construction expenses	20%
contingencies	15%
	45% Total

Item Description		Item Total $
Package Plant		420,000
Compressed Air System		15,000
Influent Pumps		72,000
	Sub-total	$507,000
	Piping and Electrical multiplier	x 1.34
	Sub-total	$679,380
Building, 60' x 65'		137,000
Influent Pump Station		44,000
Clearwell-Backwash water tank		105,000
	Sub-total	$965,380
	Yardwork multiplier	x 1.15
	Sub-total	$1,110,187
	Indirect cost multiplier	x 1.45
	Total	$1,609,800
	Use: Total Capital Investment	$1,600,000

Operation and Maintenance

Chemicals, at 3.6 MGD average flow.		
Alum, dose = 20 mg/1		$40,550
Polymer, dose = 0.5 mg/1		21,900
Caustic, dose = 5 mg/1		10,680
	Sub-total	$73,130
Building energy		$ 3,600
Process energy		24,000
Maintenance Material		8,960
Labor		150,000
	Sub-total	$186,560
	Total	$259,690
	Use: Total Annual Costs	$260,000

Design - Construct Facility

Item Description	Item-Total $
Gravity Filter and Building	380,000
Filter Mixed-media, 30"	28,000
Backwash Pumping	80,000
Surface Wash	40,000
Standard Clearwell-Backwash Water Storage	210,000
Dual Rapid Mix	21,000
Flocculation	51,000
Raw Water Pumping and Pump Station	180,000
Chemical feed systems	60,000
Sub-total	$1,050,000
ENR Cost Up-date	x 1.4
Sub-total	$1,470,000
Yardwork multiplier	x 1.15
Sub-total	$1,690,500
Indirect Cost multiplier	x 1.45
Total	$2,451,200
Use: Total Capital Investment	$2,500,000

Operation and Maintenance

Chemicals (figured previously)	$ 73,130
Process Energy	35,148
Building Energy	5,100
Maintenance Material	15,972
Labor	150,000
Total	$279,350
Use: Total Annual Costs	$280,000

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ATTACHMENT 3

Dr. Alden Lind, Ph.D.
Consultant
Save Lake Superior Association
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Dear Dr. Lind:

This letter is to clarify the Minnesota Pollution Control Agency (MPCA) position on the standards applicable to Reserve Mining Company's (Reserve) proposed discharge of tailings pond supernatant to the Beaver River. The MPCA is guided by the Minnesota Supreme Court's decision of May 27, 1977 which states:

> "The permittee shall be required to apply the best available technology to maintain water quality and to comply with all applicable laws and regulations specifically including Minnesota Regulation WPC-14 and such other standards which now or in the future may be applied to the permittee's tailings."

This decision further states that the above requirement shall apply to any water discharge from the tailings or catchment basin and such discharge shall be treated to the extent necessary to conform to all present and future water quality standards. We believe this further emphasizes the Court's intention to require that the specific goals of best available technology should be to assure that water quality requirements are met.

With this as a controlling factor, the MPCA completed a statistical analysis of fiber data collected at stations 101, 103, 111 and 112. These stations were selected because they are not impacted by water discharges to the Beaver River watershed due to the fact that the waters from these stations are upstream of the Mile Post 7 basin. It is unknown whether or not these stations may be affected [illegible]

However, while the true natural level of amphibole fibers in the Beaver River watershed is not known and cannot be determined these four upstream stations are considered representative of current upstream conditions. It should be noted that the concentration of amphibole fibers encountered at the monitoring stations located downstream of the tailings basin were found to be higher than the levels encountered at the four upstream stations.

Based on the historical record from 1978-1982 at stations 101, 103, 111 and 112, the data show a concentration of amphibole fibers up to 15×10^6 amphibole fibers per liter. The number 15×10^6 fibers per liter also represents the 95% tolerance limit for the data base. As explained by Jerry Winslow, of the MPCA at our recent meeting, this number was derived by applying non-parametric statistical techniques to a data base of approximately 66 samples. This analysis concluded that the 15×10^6 number was the appropriate estimate of the 95% tolerance limit. The procedure of defining upstream quality by determining the 95% tolerance limit has been utilized consistently by my staff to evaluate water quality throughout the state.

Determining the 95% tolerance limit for amphibole fibers for the upstream stations involved arraying all 66 data values and then calculating by non-parametric methods which individual observation best estimated the 95% tolerance limit. This approach is considered applicable even for a sample population in which many of the observations fall below the detection limit. In this case, 54 out of the 66 upstream total amphibole data points yielded what are termed "less than values". In the context of this analysis a "less than value" was defined to be an observation for which the laboratory analyst either encountered no fibers or the level of fibers encountered in the "blank" analysis was within the 95% confidence interval for the fibers counted for a specific sample. A "blank" analysis refers to the contamination encountered in the average filter analyzed for fibers without the addition of any of the sample water. The problem is that when the blank is in the range of fibers counted, we are not sure whether we are seeing the blank value, a sample value, or a combination of the two.

The result of the statistical calculation was the conclusion that the data value which best represents the 95% upper tolerance limit is the highest observation in the data set, i.e. 15×10^6 total amphibole fibers. This is not unexpected for a parameter such as amphibole fibers. Sample populations for amphibole fibers are commonly characterized by many less

than values coupled with a limited number of finite measurements, which are relatively very large in contrast to the typical or median observation. The point to remember is that all 66 data values were utilized. It is but a reflection of the distribution of the sample population that the maximum value also represents the upper 95% tolerance limit. Although the same tolerance limit would also have been selected for this distribution if all the less than values had been deleted from the analysis, it is very important to remember that it can generally be said, for all distributions, retaining the less than values would tend to keep the 95% confidence interval lower. For this reason, this procedure is more desirable than not including the less than values.

In addition to the water quality review, the MPCA has completed an analysis of treatment systems which will reduce the level of amphibole fibers, and determined an appropriate best available technology (BAT). This treatment method consists of chemical floculation and multi-media filtration. The technology is capable of removing fibers to levels around 1×10^6 fibers per liter. Because there is always some variation during normal operation of any treatment facility due to influent loading rates, chemical addition or some other variable, it can be expected that a well operated treatment facility will sometimes discharge at higher levels (i.e. greater than 1×10^6). In our discussion concerning BAT effluent limitations, Black and Veatch indicated that we could expect some variation in treatment plant performance, possibly as high as 20 to 25×10^6 fibers per liter, although such occurances will be infrequent. Based on the report prepared for the MPCA staff by our consultant, we believe that the 15×10^6 effluent limitation for amphibole fibers is representative of a maximum which considers this normal variation and therefore we have included the 15×10^6 number as a daily maximum effluent limitation in the permit. Most importantly, this limitation will assure that water quality is met.

The MPCA has also established a monthly average concentration not to exceed 10×10^6 amphibole fibers per liter. MPCA staff believes this number to be representative of plant operations and that it coincides well as a thirty day average number when compared with the 15×10^6 number.

The MPCA staff believes that the control standards set by the courts are maintained by application of the BAT effluent limitations and that the limitations which we have established for BAT will protect water quality. Although the means for determining appropriate water quality and BAT levels was done

independently, Black and Veatch was given the goal of determining a BAT which would comply with a 15×10^6 fibers per liter effluent limitation. This number has its basis in water quality but we believe it is consistent with the application of BAT as the courts intended.

In reference to your concerns regarding the historical record and the background water quality, the MPCA considers the limitations placed in the proposed permit to be best available treatment standards rather than nondegradation standards. However, we reemphasize that we also believe that existing upstream water quality will be maintained by application of BAT. Establishing effluent limitations for a parameter like fibers is indeed a very different kind of problem which presents many difficulties. My staff recognized this and on their recommendation the Agency Board acted to enter into a contract to evaluate BAT technologies. We believe that the effluent limitations in this permit are a necessary means for judging compliance and that they will reasonably assure the State that the discharge from Reserve's water filtration plant will not cause a violation of water quality. However, more important than the numbers which appear in the permit, is the process to evaluate treatment technologies. This is consistent with what the court decision requires us to do. This process resulted in both Reserve and the Agency identifying very similar filtration technologies as BAT. As a result, it appears that the environment will be protected. Application of BAT assures that Reserve will construct and operate a state of art treatment plant comparable to that serving the citizens of Duluth and other North Shore municipalities.

I hope this clarifies this matter and addresses your concern regarding preservation of the historical record on fiber levels appropriate for establishing standards for the referenced discharge.

If you have any questions or comments, please contact me.

Sincerely,

/s/

Sandra S. Gardebring
Executive Director

SSG:nmp

cc: Mr. Arnold Overby, Silver Bay

J 6447

Save Lake Superior Association
P.O. BOX 101 ☐ Two Harbors 16
TO PREVENT THE POL[illegible] OF LAKE [illegible]PERIOR

RECEIVED
MAY -8 1984
M.P.C.A.
Water Quality Div.

April 26,1984

Ms. Sandra S. Gardebring
Executive Director
MN Pollution Control Agency
1935 West County Road B2
Roseville, MN 55113-2785

RECEIVED
MAY - 4 1984
MINN. POLLUTION
CONTROL AGENCY

Dear Ms. Gardebring:

Based on your letter of April 24, 1984, it is my decision to advise the SLSA board to not request a public hearing on Reserve Mining Company's permit application for discharge of tailings basin waters to the Beaver River. That counsel is based on the following understanding of your letter: The principal standard to be applied to Reserve's discharges is Best Available Technology.

This must be the standard, for no statistical manipulation can support the numerical standards of 15 million as a daily maximum and 10 million as a 30 day maximum. Of the 66 samples chosen at sites 101,103,111,and 112, 56 had levels of less than a million amphibole fibers/liter. Of those 56, 42 had amphibole fiber levels of less than 500,000 with all but two of those being below the pertinent detection limit. Of the remaining 10 samples, 4 were between 1-2 million, 1 between 2-3 million, 1 between 4-5 million, and 2 between 6-7 million. Then there were 2 outliers, one of which was 13.4 million, the other 15 million, both of them from site #103, one taken on the first of April, the other on the first of July, 1980.

Now, confidence, or tolerance, intervals in distribution-free cases can be calculated, according to Wilks, using order statistics. A subsequent work by Robbins proved that only order statistics will provide such intervals.

But, as with any sampling problem, it is required that the sample come from a population. That is not as benign a statement as it might appear. Sampling a population requires that you be able to specify beforehand the inclusion-exclusion criteria. A population of human beings is relatively easy. But, how about a population of red-heads. How red must a person's hair be? Or, what of a population of water which is episodically seriously affected--"zapped"-- by massive inputs of air-borne amphibole fibers? Your letter correctly points out that "It is unknown whether or not these stations may be affected by air emissions." It might have pointed out, as well, that it is not known whether there was any unusual construction activity, such as the construction of the saddle dams, in that [illegible]

period April-June, 1980.

Thus, it seems very likely to me that the 66 samples used here do not represent "the same population." I would contend, on the basis of the overall distribution,the appearance of these two figures, 13.4 and 15 million, within a period of three months at the same site, and the distribution of various types of amphibole fibers that we are looking at two samples of water impacted by construction or other activity. Furthermore, it is not clear that this impact was not a result of activities which violated the permit conditions regarding air quality and discharge.

Now, order statistics are notably insensitive to outliers, regardless of the reasons for those outliers. Order statistics simply rank the 66 observations from 1 to 66 thus obscuring the additional information one obtains from simple inspection, i.e., the range, variance, and other statistics. It is doubtful that any reputable statistician would conclude after reviewing the facts that the figures 10 million and 15 million can be validly based on any statistical analysis of the data at hand.

It is my understanding, after reading the letter, that you are not seeking to force that interpretation. I assume that your reference to Black and Veatch refers to their projections of the consequences of a catastrophic failure of the filtration system based not on their analysis of the 66 samples but rather on their analysis of the operation of similar plants. I accept the 10 million and 15 million limits as representing the consequences of such failure, not as valid reflections of a stable "population" of water quality at the four sites.

It is not my desire to impede the granting of the permits. I fully understand the scheduling problems and am anxious to expedite the process in whatever way I can, in good conscience. I would not be true to my understanding of the responsibilities of statisticians and certaintly not of environmentalists were I to agree to the basis which your staff sought initially to lay for those figures.

I leave it up to you, then. We will, until additional evidence and permit renewal times provide opportunity for review, accept the 10 and 15 million figures as limits on the failure of BAT. We will not accept them if such acceptance is believed by anyone to imply acceptance of them as empirically derived from those 66 samples. If you have any questions concerning our position fee free to contact me at (218)525-2692.

Sincerely,

Alden E. Lind
for the SLSA Board

P6991

Save Lake Superior Association

TO PREVENT THE POLLUTION OF LAKE SUPERIOR

Box 386
Beaver Bay, MN 55601
May 3, 1984

Sandra S. Gardebring, Executive Director
Minnesota Pollution Control Agency
1935 West County Road B2
Roseville, Minnesota 55113-2785

Dear Ms. Gardebring:

I have polled the members of the board of directors and a majority agree that the letter addressed to you by Dr. Alden Lind, dated April 26, 1984, regarding Reserve Mining Company's basin water discharge permit application, accurately reflects the opinions of the board of directors of the Save Lake Superior Association.

Sincerely,

Arnold G. Overby
President, SLSA

MINN. POLLUTION CONTROL AGENCY

ATTACHMENT 4

INITIAL SCHEDULE FOR RESERVE MINING PROPOSED TREATMENT SYSTEM

1. Establishment of Limitiations and/or Standards based on Water Quality by January 27, 1984. (Completed February 1, 1984).

2. Collection of Fiber Data with Mile Post 7 at Operational Levels by February 3, 1984. (Collected Feburary 1, 1984)

3. Selection of a Consultant by Feburary 7, 1984. (Completed February 1, 1984)

4. Results of Fiber Analyses from Minnesota Department of Health by February 17, 1984. (Received February 15, 1984)

5. Submittal of Proposal by Reserve for Treatment of Fibers by March 1, 1984. (April 5, 1984)*

6. Consultant Review of Reserve Proposal and Best Available Technology by March 26, 1984. (April 23, 1984)*

7. Minnesota Pollution Control Agency Staff Review of Consultant Report by April 1, 1984. (March 30, 1984)

8. MPCA Staff Preparation of Draft Permit and Draft Permit Sent for Review by Interested Parties by April 15, 1984. (April 5, 1984).

9. All Comments Received Back from Interested Parties by April 30, 1984. (April 20, 1984)

10. Special Board Meeting to Determine Need for a Hearing on May 8, 1984.**

11. Public Notice of Draft Permit and Hearing by May 11, 1984. (April 7, 1984)**

12. Issuance of Permit in the Event that a Hearing is not Required by June 19, 1984.

13. Hearing on Draft Permit held on June 26, 1984.

14. Receipt of Hearing Officer's Findings on Hearing No Later than July 7, 1984.**

15. Special Board Meeting for Issuance of Final Permit on July 31, 1984.**

* Completion of these items was subject to Reserve submitting their proposal which was approximately five weeks after originally scheduled.

** The portion of these items which relate to a public hearing will likely not be necessary. If a hearing was necessary item 10 would be changed to May 22, 1984 and an additional item for notice of the hearing would be scheduled for May 27, 1984.

Attachment 5

Procedural Rules for Contested Case Hearings

Existing procedural rules require that a decision to hold a hearing must be accompanied by a clear statement of what the issues are, and a finding that a hearing is an appropriate means to resolve these issues. Specifically 6 MCAR 4.4013 requires that the Agency hold a contested case hearing if it finds all of the following:

1. that a person requesting the contested case hearing has raised a material issue of fact or of the application of facts to law related to the director's preliminary determination or the terms of the draft permit;

2. that the agency has jurisdiction to make determinations on the issues of fact or of the application of facts of law raised by the person requesting the contested case hearing; and

3. that there is a reasonable basis underlying issues of fact or law raised by the person that requests the contestd case hearing such that the holding of a contested case hearing would aid the agency in making a final determination on the permit application.

SF-00005-03

STATE OF MINNESOTA

DEPARTMENT MN POLLUTION CONTROL AGENCY

Office Memorandum

TO: Barry C. Schade
Director
Division of Water Quality

DATE: February 3, 1984

FROM: Jerry C. Winslow P.E. JCW
Monitoring and Analysis Section

PHONE: 6-7363

SUBJECT: EFFLUENT LIMITATIONS FOR THE PROPOSED DISCHARGE FROM THE MILE POST 7 TAILINGS BASIN

INTRODUCTION

The intermittent operation and the limited production of the Reserve Mining Company (RMC) taconite plant at Silver Bay, Minnesota has prompted the Company to propose a discharge of the excess water accumulating at the Mile Post 7 Tailings Basin. The purpose of this memorandum is to recommend permit requirements and effluent limitations for such a discharge to surface waters in the Beaver River watershed. The recommendations are in accordance with and based upon the rulings of the Minnesota Supreme Court and the requirements of Minnesota Rules 6 MCAR 4.8014.

RECOMMENDATIONS

1. Pursuant to the ruling of the Supreme Court the water being collected in the seepage recovery basins should continue being returned to the basin.
2. If the proposed discharge is made to the Beaver River or any of its tributaries, the concentration of amphibole fibers in the discharge should not exceed 15×10^6 amphibole fibers per liter.
3. Any discharge to the Beaver River or its tributaries should correspondingly be limited to 3×10^6 chrysotile fibers per liter.
4. Any treatment system which may be built to comply with these effluent limitations should be designed for 95% compliance.
5. Fiber analysis by transmission electron microscope should be performed at least once per month during periods of discharge.
6. Whether the discharge will have to be limited and/or monitored for fluoride cannot be finalized until receipt of the following specific information:
   a) the rate of discharge,
   b) the location of the discharge,
   c) and the expected fluoride concentration of the effluent after treatment for the removal of amphiboles. If this concentration exceeds 1.5 mg/l fluoride, an effluent limitation and/or a monitoring requirement for fluoride may be required.

SUPREME COURT RULING

In Reserve Mining Co. vs. Herbst, 1977 the court ruled:

> "The permittees shall be required to apply the best available technology to maintain water quality and to comply with all applicable laws and regulations, specifically including Minn. Reg. WPC 14 and such other standards which now or in the future may be applied to the permittees' tailings. This technology shall include specifically, but not exclusively, the following:
> 1) The tailings disposal system shall be operated as a closed system including the collection of seepage and surface runoff for return to the basin.
> 2) A dual pipeline system with required controls, spill detection devices, emergency catchment basins and other protective devices.
> 3) Any water discharge from the tailings or catchment basin shall be treated to the extent necessary to conform to all present and future water quality standards."

SPECIFIED WATER QUALITY STANDARDS

With this background and court ruling in mind, the task of setting effluent limitations for the proposed discharge proceeded as follows. First of all, a review of the available Reserve and MPCA data was made to determine which constituents in the basin water may prompt water quality problems or cause water quality standard violations in the receiving stream, in this case the Beaver River and/or its tributaries.

The specific water quality standards which must be considered are those associated with the classification of use for the receiving stream. The Beaver River and its tributaries in the vicinity of the basin are classified by Minnesota Rule 6 MCAR 4.8024 as class 1B, 2A, 3B waters. These designations denote that these waters are trout fisheries which are also to be maintained suitable for domestic consumption after disinfection. Lake Superior is also classified for these same uses.

This data assessment revealed that for those parameters which have specified numerical standards in 6 MCAR 4.8014, the only parameter of concern was fluoride. No potential chronic or acute toxicity problems for heavy metals appear probable. The class 1B water quality standard for fluoride is 1.5 mg/l while three samples collected by the MPCA in October, 1983 averaged 4.1 mg/l. Data collected by RMC during 1982 reportedly averaged 6.1 mg/l fluoride within a range of 7.6 to 4.0 mg/l fluoride.

In contrast the RMC monitoring program has shown the ambient level of fluoride in the Beaver River watershed has been consistently less than .5 mg/l total fluoride. Thus, depending on the location and the rate of discharge, it is conceivable that the dilution effect of the receiving stream may prompt compliance with the fluoride standard during all but periods of drought. Furthermore, it is possible that the treatment provided to remove amphibole fibers may reduce fluoride levels to 1.5 mg/l or at least to a concentration sufficient to render consistent compliance with the water quality standard after allowance is made for dilution. In order to resolve whether additional fluoride will have to be removed from the basin water the information outlined in recommendation number six must be supplied by the RMC.

AMPHIBOLE AND CHRYSOTILE FIBERS

Obviously, the primary concern in regard to any proposed discharge from the Reserve Mining Company is the potential health threat posed by amphibole fibers. The Eighth U.S. Circuit Court of Appeals has affirmed that the fibers contained in the RMC tailings may be considered as carcinogenic and that a discharge of these fibers to Lake Superior give rise to a reasonable medical concern for the public health.

The fibers generally alluded to in this finding are called "amphiboles". Amphiboles are one of the two major groups of numerous fibrous mineral silicates commonly called "asbestos"; the other major group is chrysotile.

Since no amphibole fiber count data were available for basin water, the MPCA staff collected three samples from the recovery water basin in October, 1983. The total amphibole concentration in the three samples were 123, 174, and 205 x 10^6 fibers per liter yielding an average concentration of 167 x 10^6 fibers/l.

It must be emphasized that these samples were collected following a period when the taconite plant had not been in operation for many months; therefore it could be expected that during periods of production that the concentration of fibers held in suspension may be substantially higher. Additional sampling scheduled for this winter or spring should resolve this question.

Samples were also collected in each of the three seepage recovery basins; the amphibole fiber levels in these waters ranged from 10.1 to 52.4 x 10^6 fibers/l. Under the current mode of operation, the water collected in all of these relatively small catchments is returned to the major basin.

Pursuant to the aforementioned court ruling, the key to regulating any discharge from the tailings basin is to determine the applicable water quality standard for amphibole fibers. While Minnesota Rules define numerical water quality standards for many parameters, as of yet no specific water quality standard for amphibole fibers has been established by the State. Nevertheless, Minnesota Regulation WPC 14, now officially referred to as 6 MCAR 4.8014, contains provisions which define the approach which is to be used to regulate heretofore undefined substances such as amphibole fibers. Specifically section c.14. states:

> "Questions concerning the permissable levels, or changes in the same of a substance, or combination of substances, of undefined toxicity to fish or other biota shall be resolved in accordance with the latest methods recommended by the U.S. Environmental Protection Agency." (USEPA)

Thus the MPCA can set a water quality standard for amphibole fibers as long as the latest methods of the USEPA are utilized. In regard to asbestos the USEPA published in October 1980 a document entitled Ambient Water Quality Criteria for Asbestos. This document recommends the following criteria for asbestos fibers:

> "For the maximum protection of human health from the potential carcinogenic effects of exposure to asbestos through ingestion of water and contaminated aquatic organisms, the ambient water concentration should be zero. The

estimated levels which would result in increased lifetime cancer risks of 10^{-5}, 10^{-6} and 10^{-7} are 300,000 fiber/l, 30,000 fibers/l, and 3,000 fibers/l, respectively."

The way these criteria are written emphasizes a number of points pertinent to this memorandum. First of all, it is important to note which specific fibers are being considered in these criteria. Within the context of this document, asbestos is defined to be chrysotile, crocidolite, fibrous cummingtonite-grunerite including amosite, fibrous tremolite, fibrous actinolite, and fibrous anthophyllite. The fibers known to be associated with the tailings of the RMC are amphiboles, predominantly of two forms cummingtonite-grunerite and actinolite. While medical experts continue to debate and determine which specific fibers may be carcinogenic, this reference points out that the type of amphibole fibers associated with the RMC tailings are a public health concern. Furthermore, regulatory controls to protect public health should consider amphibole fibers in general plus chrysotile fibers as well if these fibers are also present.

What is most noteworthy and atypical of these USEPA criteria is that these criteria lay out a spectrum of risk for a given fiber concentration. Thus, the state agency utilizing these criteria to set a water quality standard can seemingly establish a standard which reflects that particular state's position in regard to what degree of cancer risk is acceptable to its citizenry. For example, Minnesota may propose a reasonable drinking water standard for amphibole plus chrysotile fibers of 300,000 fibers per liter which according to this reference would increase the risk of cancer for a lifetime consumer by 10^{-5} or 1 in 100,000. In other words if 100,000 people drank this water for their lifetime, one individual would be expected to die of cancer attributable solely to the ingestion of these fibers in his or her drinking water. Such a risk is comparable to many other risks in our society. For example, the risk of death by lightning in a lifetime is 3.5×10^{-5} while the risk to the average citizen of dying due to air travel is 70×10^{-5} (Kim and Sonte, 1980).

Thus it would appear that 300,000 amphibole plus chrysotile fibers per liter may be a reasonable water quality standard for Minnesota lakes and streams designated for domestic comsumption. However, if this criterion of 300,000 amphibole plus chrysotile fibers per liter was applied as the water quality standard for the Beaver River and its tributaries, it may have been and may currently be exceeded in the majority of the samples collected upstream of the tailings basin.

Based upon the RMC monitoring program the median concentration of amphibole fibers encountered at the four upstream stations was found to be less than 360,000 fibers per liter while the median concentration of chrysotile fibers was less than 320,000 fibers per liter. Thus, in over one half of the samples collected between 1978 and 1982 the total number of amphibole plus chrysotile fibers could have been as high as 680,000 fibers/l or as low as zero fibers per liter. Therefore, it does not seem appropriate to adopt a water quality standard which may normally be exceeded in the natural state. In recognition of such situations, provisions in 6 MCAR 4.8014 provide an approach to regulate a discharge where

the applicable water quality standards are or may be exceeded naturally. The rule states in section A.7.:

> "The intrastate waters may, in a state of nature, have some characteristics or properties approaching or exceeding the limits specified in the water quality standards....Where the background level of the natural origin is reasonably definable and normally is higher than the specified standard the natural level may be used as the standard for controlling the addition of pollutants of human activity which are comparable in nature and significance with those of natural origin."

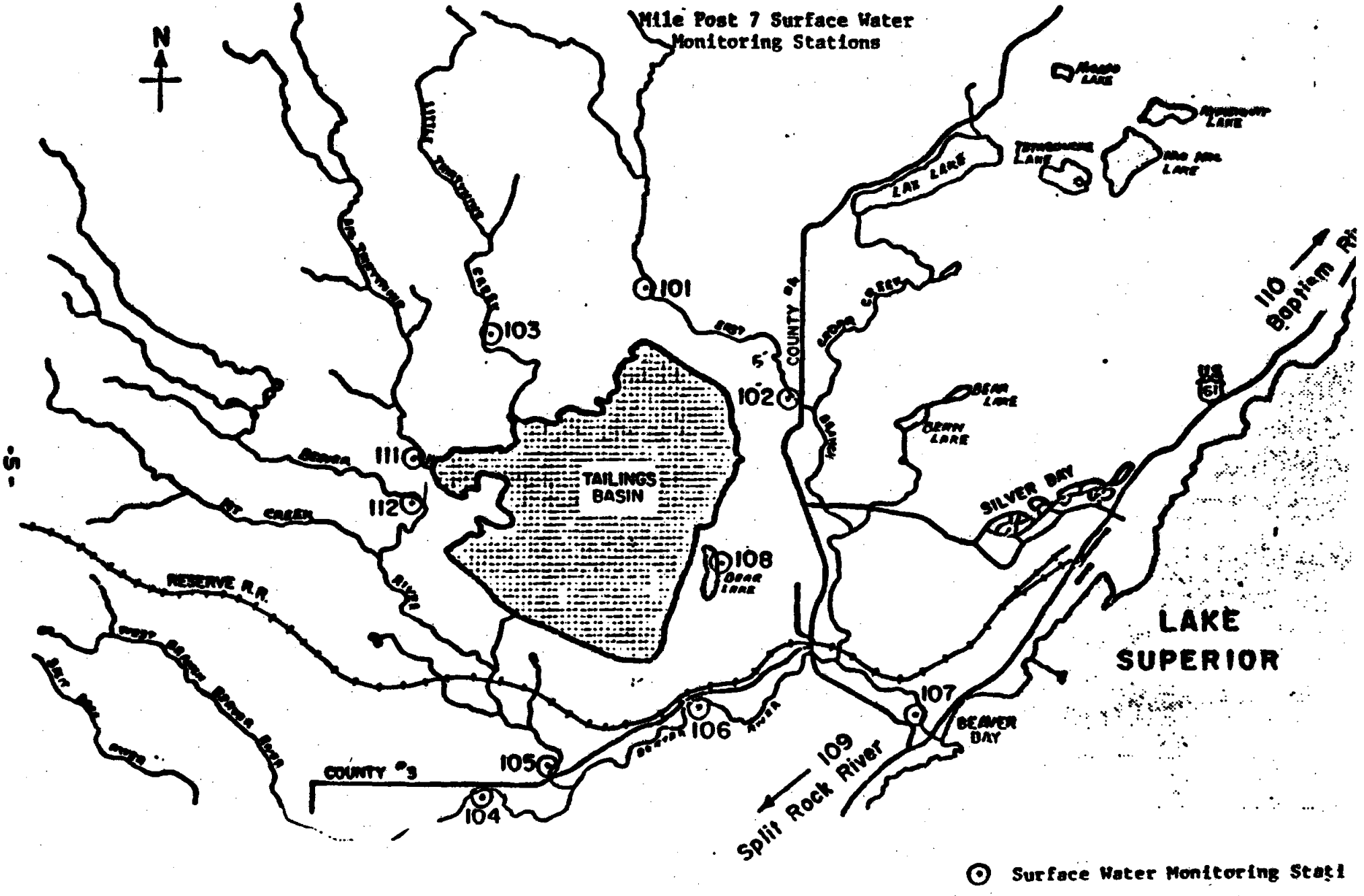
Pursuant to this section the MPCA can establish an effluent limitation for controlling fibers based upon the natural concentration of fibers found in the receiving water. Towards this end the MPCA staff has reviewed the surface water monitoring data for fibers collected as part of Reserve's Mile Post 7 monitoring program. Surface water samples from ten sampling stations in the vicinity of the basin plus two sampling stations in adjacent watersheds have been analyzed for fibers by the method of transmission electron microscope (TEM) at the Minnesota Department of Health. Reference is made to Figure 1 for the location of the sampling stations. Fiber samples were collected between 1978 and 1982. The MPCA staff has utilized statistical techniques to analyze the data via the "SAS" system, a nationally recognized statistical analysis system accessed through the National Computer Center.

It can be seen by looking at Figure 1 that four of the stations are located upstream of the tailings basin. These stations are identified as number 101, 103, 111, and 112. A statistical examination of the data for these stations demonstrated that the concentrations of fiber levels encountered at these locations are significantly different than the concentration of fibers encountered at associated downstream locations. While the cause of this difference is not discernible by this analysis, it does suggest that the existence of and/or the activities associated with the tailings basin may be increasing the levels of fibers in adjacent surface waters.

Therefore, in conformance with section A.7. the fiber data collected at these four stations have been grouped together and assessed as representative of "natural origin". The resultant frequency distribution for fibers was found to be a nonnormal distribution composed of 66 observations. For total amphibole fibers the vast majority (54) of the 66 analyses yielded what are termed "less than values". In the context of this memorandum a "less than value" has been defined to be an observation for which the laboratory analyst either encountered no fibers or the level fibers encountered in the "blank" analysis was within the 95 percent confidence interval for counting. A "blank" analysis refers to the contamination encountered in the average filter analyzed for fibers without the addition of any of the sample water.

The 95 percent upper tolerance limit for amphibole fibers for the upstream stations was found to be 15×10^6 fibers per liter. Since the frequency distribution was found to be nonnormal, the 95 percent tolerance limit was calculated using non parametric statistics. Thus, assuming the "natural" amphibole fiber level does not change from 1978 to 1982 levels, it could be expected that in an infinite number of samples 95% of the samples would fall below 15×10^6 amphiboles per liter.

FIGURE 1


Mile Post 7 Surface Water Monitoring Stations
N
101
102
103
104
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106
107
108
109
110
111
112
TAILINGS BASIN
LAKE SUPERIOR
Split Rock River
COUNTY #3
COUNTY #4
RESERVE R.R.
SILVER BAY
BEAVER BAY
BEAR LAKE
DEWEY LAKE
LAX LAKE
US 61
Surface Water Monitoring Stati

Based upon this analysis and the provisions of section A.7. it is recommended that any discharge of treated basin water to the Beaver River watershed not exceed the "natural level" defined to be 15 x 10^6 amphibole fibers per liter, the 95% upper tolerance limit for the upstream stations. If the treatment system meets this limit at least 95% of the time and its variability approximates that of the natural streams, the discharge should be reasonably reflective and comparable to the frequency distribution of amphibole fibers found in the natural background.

In regard to chrysotile fibers only two out of the 66 upstream samples revealed finite levels of fibers while the remaining 64 samples have been tabulated as "less than values". Both of the finite values approximated 3 x 10^6 chrysotile fibers per liter; therefore the 95 percent upper tolerance limit for chrysotile fibers would be 3 x 10^6 fibers per liter.

A finite concentration of chrysotile fibers was found in only one of the three samples collected in the recovery basin during October, 1983. That value was found to be 30.8 x 10^6 chrysotile fibers per liter while the other two values were less than 4.84 and 5.87 x 10^6 fibers respectively. Thus, it would appear that the levels of chrysotile fibers in the tailings water do exceed that encountered in the natural background, possibly by at least an order of magnitude. This being the case and in recognition of the recognized health risk for chrysotile fibers, it is recommended that chrysotile fibers be controlled in concert with amphibole fibers. As per the rationale proposed for amphibole fibers, the effluent should be treated to less than 3 x 10^6 chrysotile fibers per liter, based upon compliance in at least 95 percent of the samples.

DISCUSSION

In light of the evidence that amphibole fibers pose a threat to public health, it could be argued that all fibers should be eliminated from the proposed discharge of Reserve Mining. However, such an approach would fail to recognize the millions of supposedly equally harmful fibers already being carried by the Beaver River and other sources into Lake Superior. Based upon data collected between 1978 and 1982, the mean concentration of amphibole fibers in the Beaver River near its confluence with Lake Superior is 28.8 x 10^6 amphibole fibers/liter. It is further estimated that the daily average flow rate of the Beaver River as it enters Lake Superior is approximately 150 cfs. This rate had to be estimated since continuous flow gaging records are not available for this river at its mouth. This estimate is based upon data collected by the U.S. Geological Survey (USGS) for the adjacent Baptism River between 1927 and 1981. For that period of record the daily average flow rate of the Baptism River was 167 cfs generated by a drainage area of 140 square miles. If the 126 square mile drainage area of the Beaver River is assumed to yield a corresponding rate of runoff, the daily average flow of the Beaver River becomes 150 cfs. As a result of multiplying mean concentration of fibers by the average daily flow rate, it is estimated the Beaver River currently discharges approximately 1.06 x 10^{16} amphibole fibers per day into the Lake Superior.

In contrast the proposed discharge from the RMC tailings basin would involve a flow rate on the order of 2500 gpm or about 5.6 cfs. If the effluent is treated

to the proposed standard of 15×10^6 amphibole fibers per liter, the maximum average rate of discharge for fibers would be 2.04×10^{14} amphibole fibers per day or approximately 2 percent of the Beaver River loading rate. Assuming that the treatment facility is designed to meet the 15×10^6 effluent limitation 95% of the time, a more typical effluent concentration may be on the order of 1×10^6 fibers/liter. If such was the case, the average daily discharge would be expected to equal 0.14×10^{14} amphibole fibers per day which constitutes only one tenth of one percent of the estimated average loading for amphibole fibers from the Beaver River.

While any of these loading rates may appear high, it is pertinent to note that prior to the installation of the Mile Post 7 tailings basin, the daily Reserve Mining Company direct discharge to Lake Superior was estimated to contain 10^{21} amphibole fibers (Cook, 1975), 100,000 times the present loading of the Beaver River. Furthermore, the maximum discharge to the lake by the RMC being considered in this memo (2.04×10^{14} amphibole fibers per day) represents but 2×10^{-5} percent of their company's former loading rate.

In conclusion, it is inconceivable that the proposed discharge being recommended in this memorandum will significantly affect the current level of amphibole fibers in Lake Superior and the various domestic water supply intakes around the lake. Furthermore, the projected increased loading of amphibole fiber in the Beaver River system should not exceed two percent in the long term, and thereby the uses of that river should not be restricted as well.

While this memorandum has been written to address a proposed discharge to the Beaver River or one of its tributaries, the Reserve Mining Company may also propose to discharge treated basin water directly to Lake Superior. The effluent limitations given in this memorandum are not necessarily applicable for such a direct discharge. If such an alternative is pursued, the effluent limitations given here should be reviewed in light of the fiber data available for Lake Superior.

A discharge to the Beaver River watershed offers the following potential advantages to a direct lake discharge:

1. The ambient concentrations of amphibole fibers are typically higher in the Beaver River than in Lake Superior in the vicinity of Silver Bay.
2. The additional water supplied by the discharge may be beneficial in maintaining the trout fisheries throughout the watershed, particularly during drought conditions.
3. The streams may provide additional removal of fibers before entering Lake Superior.

JCW/tj

REFERENCES

Cook, P.M. et al. 1976. "X-ray Diffraction and Electron Beam Analysis of Asbestiform Minerals in Lake Superior Waters. Proceedings: International Conference of Environmental Sensing Assessment.

Kim, Nancy K. and Daniel W. Stone. 1980. Organic Chemicals and Drinking Water. New York State Department of Health. 1.

U.S. Environmental Protection Agency. 1980. Ambient Water Quality Criteria for Asbestos. vi.

STATE OF MINNESOTA

DEPARTMENT POLLUTION CONTROL AGENCY

Office Memorandum

TO: Barry C. Schade, Director
Division of Water Quality

DATE: March 13, 1984

THRU: John F. McGuire, Chief, Mon. & Analysis Section

FROM: Jerry C. Winslow
Monitoring and Analysis Section
Division of Water Quality

PHONE: 6-7363

SUBJECT: EFFLUENT LIMITATIONS FOR THE PROPOSED DISCHARGE FROM THE MILE POST 7 TAILINGS BASIN TO LAKE SUPERIOR

INTRODUCTION

This memorandum will augment my memorandum of February 3, 1984. In that document, recommended effluent limitations were given for the proposed discharge by the Reserve Mining Company (RMC) to the Beaver River or one of its tributaries. In this memorandum, a potential discharge made directly to Lake Superior will be considered. In addition, an update will be provided of what is known about whether chrysotile fibers are present in the basin water. The following recommendations are in accordance with and based upon the rulings of the Minnesota Supreme Court and the requirements of Minnesota Rule 6 MCAR § 4.8015.

RECOMMENDATIONS

1. If the proposed discharge is made directly to Lake Superior, the concentration of amphibole fibers should not exceed 3×10^6 amphibole fibers per liter.

2. Any treatment system which may be built to comply with this effluent limitation should be designed for 95% compliance.

3. The proposed discharge need not be limited for chrysotile fibers for either a direct discharge to Lake Superior or a discharge to the Beaver River watershed. This recommendation supersedes statements made in my earlier memorandum in which an effluent limitation of 3×10^6 chrysotile fibers per liter for a discharge to the Beaver River or its tributaries was recommended.

4. Fiber analysis by transmission electron microscope should be performed at least once per month during periods of discharge. The analysis should enumerate chrysotile fibers.

5. No effluent limitation is required for fluoride if the discharge is made directly to Lake Superior.

SUPREME COURT RULING

As specifically cited in the earlier memorandum, the Supreme Court of Minnesota ruled that any discharge from the tailings basin shall be treated as necessary to conform to the water quality standards. Furthermore, the permittees shall be required to apply best available tcchnology to maintain water quality and to comply with all applicable laws and regulations.

SPECIFIED WATER QUALITY STANDARDS

With these requirements in mind, the available MPCA and Reserve data were reviewed to determine which pollutants in the basin water might prompt water quality problems or cause water quality standard violations in Lake Superior.

Lake Superior is classified by Minnesota Rule 6 MCAR § 4.8025 as a class 1B and 2A water. These designations denote that the lake is a trout fishery which is also to be protected for domestic consumption upon disinfection.

The data assessed revealed no apparent problems for those water quality parameters for which Minnesota has adopted specific numerical standards. This is to be expected in the case of a relatively small discharge entering a very large lake. Pollutants which may exceed chronic water quality standards in the discharge would be promptly diluted within the mixing zone. This would be the fate of the fluoride contained in the basin water. Although the basin water has a fluoride concentration of 4 to 6 mg/l, the 1.5 mg/l Minnesota water quality standard for Lake Superior would be achieved within the mixing zone since the ambient fluoride concentration for Lake Superior is less than .10 mg/l. Furthermore, based upon a review of the data currently available, no pollutant appears to be present in the basin water at a concentration known to be acutely toxic to aquatic life.

AMPHIBOLE FIBERS

As was the case for the potential Beaver River discharge, the primary concern becomes the proposed discharge of amphibole and chrysotile fibers. As pointed out in the earlier memorandum, Minnesota Rules do not specify a numeric water quality standard for either amphibole or chrysotile or a combination of these fibers.

As a result, the development of an effluent limitation for a potential discharge of these constituents to Lake Superior requires an assessment of U.S. EPA criteria and background fiber data in Lake Superior. For a thorough discussion of the statutory basis

and the associated methodology for determining effluent limitations in this manner, please refer to the rationale presented in the earlier memo. Suffice it here to say that effluent limitations for a lake discharge will be based upon background natural data for Lake Superior in the same manner as was done for the Beaver River.

In order to comply with the intent of the section A.7. in 6 MCAR § 4.8015, the data base selected to determine the effluent limitations for amphibole fibers ideally should meet the following criteria:

a) be representative of the "background level of the natural origin",
b) be "reasonably definable",
c) be normally higher than the specified water quality standard, and
d) be representative of the quality in the vicinity of the discharge.

The initial data base selected to perform this assessment were the data collected by the U.S. EPA Environmental Research Laboratory at Duluth. Data collected prior to 1981 were not utilized since these earlier data would have reflected the adverse impact of the former RMC direct discharge of tailings to the lake. Since cessation of that discharge in 1980, the fiber levels in the lake have decreased markedly. It appears that fiber levels in the lake are approaching a fairly stable equilibrium concentration which only becomes highly variable during and following major storm events. Fiber count data performed by transmission electron microscope (TEM) methods are available at four municipal water intakes - Silver Bay, Beaver Bay, Two Harbors, and Duluth. A total of 33 samples were collected between 1981 and 1983; of that number seven samples were collected at the Silver Bay station.

Since one of the primary purposes of collecting the data was to determine how high amphibole fiber levels might go under adverse conditions, approximately one half of the samples were collected on days characterized by storms. These data demonstrated that much higher levels of amphibole fibers are evident during and immediately following storm events, particularly in the vicinity of Beaver Bay. Amphibole fibers levels may increase by an order of ten or even more under such conditions when wind and wave action might resuspend previously settled fibers. Therefore, data reflective of storm events will not be used to define background levels.

An examination of the remaining non-storm data indicates that fiber levels were higher at the uplake stations of Duluth and Two

Harbors. This phenomenon is purported to result from the prevailing uplake currents along the north shore of Lake Superior coupled with the upswelling of the deeper fiber-laden currents as they enter the shallower Duluth area. These two factors tend to elevate the level of fibers at Duluth relative to the lower, more indicative of natural, concentration of fibers encountered upcurrent of the tailings delta at the Silver Bay water intake.

Thus, the fiber data collected at all three of the stations located downcurrent from Silver Bay are probably not representative of the natural background concentration of Lake Superior near Silver Bay. This leaves for consideration only the data collected at the Silver Bay water intake during non-storm events, a limited data set of three samples out of the initial 33 observations available. The three remaining observations which best satisfy the four stated standards setting criteria are .5, 1, and 3×10^6 amphibole fibers per liter.

Since this data base is so limited, the use of statistical techniques to determine a 95 % confidence interval is questionable at best. If the frequency distribution is assumed to be normally distributed, the estimated 95% upper tolerance limit would approximate 3.6×10^6 fibers per liter. However, the various available data sets for fibers assessed both in this assessment and the Beaver River watershed assessment have demonstrated that fiber levels fit neither a normal nor a lognormal distribution. If nonparametric statistics are utilized as per the Beaver River study, this small data base yields an estimated 95% tolerance limit of 3×10^6 fibers per liter, simply the maximum value in the set.

Thus, it would appear that 3×10^6 amphibole fibers per liter may be a reasonable estimate of the current background level of fibers in Lake Superior near Silver Bay. It could certainly be argued that this concentration and these data do not necessarily reflect the natural level since the lake even upcurrent of the tailings delta probably still reflects some residual contamination of amphibole fibers associated with the past discharge of Reserve Mining. On the other hand, however, the limited size of the current data base at Silver Bay may significantly underestimate the true 95% confidence interval even for current non-stormy conditions. Unfortunately, no way is known to quantify these two offsetting concerns with the information currently available. Therefore, it is concluded here that pursuant to the existing data the background level of amphibole fibers at Silver Bay could be reasonably defined to be 3×10^6 amphibole fibers per liter.

Having so defined the background, it is further recommended that any discharge treated basin water to Lake Superior in the vicinity of Silver Bay not exceed 3×10^6 amphibole fibers per liter.

If the treatment system meets this limit at least 95% of the time and its variability approximates that of the lake, the discharge should, in effect, be discharging at natural background levels. Obviously, on any given day the concentration of fibers in the discharge may or may not exceed that found in the lake, but over the long term the discharge should not elevate the concentration of amphibole fibers in the lake.

Since the completion of the February 3, 1984 memorandum, three additional samples of the basin recovery water have been analyzed for mineral fibers. The purpose of collecting these samples was primarily to determine whether the concentration of fibers has increased since the taconite plant reinitiated operation in early January. The average level of total amphibole fibers in these three samples increased from 167 to 377 x 10^6 fibers per liter upon plant startup.

CHRYSOTILE FIBERS

These three additional samples also provided very needed information in regard to whether the basin water might contain significant levels of chrysotile fibers. As stated in my earlier memorandum, chrysotile fibers were encountered at a finite concentration in one of the three earlier basin samples. That value was reported to be 30.8 x 10^6 chrysotile fibers per liter while the other two values were interpreted to be less than 4.84 and less than 5.87 x 10^6 fibers per liter respectively. ~~It is worthy to note that due to the volume of the sample actually filtered in the analysis, the 30.8 x 10^6 chrysotile fibers per liter observation was the result of identifying only three individual fibers in the analysis.~~

While amphibole fiber levels have apparently doubled since plant startup, the new data indicate that chrysotile levels have not increased and may, in fact, not have been significant in the first sampling. The results of all three samples are interpreted to be less than values - specifically less than 22.5, 23.1, and 27.7 x 10^6 fibers per liter. Only one chrysotile fiber was found in the three latest samples indicating that both this solitary fiber and the three discrete fibers encountered in the earlier sample may have been attributable to the contamination of the filter pad or other such contamination associated with the laboratory analysis. The problem of chrysotile contamination in the analytical procedure is well documented and apparently unavoidable.

Based upon these findings it is concluded that insignificant levels of chrysotile fibers are present in the basin water and that the proposed Reserve Mining discharge need not be controlled for

chrysotile fibers. This conclusion supersedes my recommendation of February 3, 1984 in which it was proposed that the discharge should be limited by permit to 3 X 10^6 chrysotile fibers per liter. This is not to suggest that the basin water does not contain some chrysotile fibers; what is being stated is that based upon available data it appears at the present time that the level of chrysotile fibers in the basin water is not significantly different than the level of chrysotile fibers encountered throughout the Beaver River watershed and in Lake Superior.

In lieu of limiting the concentration of chrysotile fibers in the permit, it is recommended that the concentration of chrysotile fibers continue to be reported in any effluent monitoring of mineral fibers encumbant upon the permittee. This data should provide the information necessary to either confirm or reject the conclusions given here. If chrysotile fibers should ever occur at significant concentrations, permit requirements could then be developed at that time if it is deemed necessary to further limit these type of fibers to maintain the applicable water quality standards or water uses.

JCW:jae

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DESCRIPTIONS OF THE SAMPLING LOCATIONS IN THE MILE POST 7 FIBER MONITORING PROGRAM

STATION NUMBER	LOCATION	COMMENT
101	East Branch of Beaver River	Upstream of tailings basin
102	East Branch of Beaver River	Downstream of tailings basin
103	Little Thirtynine Creek	Upstream station
104	West Branch Beaver River	Headwater station in adjacent catchment area
105	Beaver River	Downstream station
106	Beaver River near proposed point of discharge	Downstream station
107	Beaver River at mouth	Quantifies load to Lake Superior
108	Bear Lake	Isolated nearby lake
109	Split Rock River	Control station in different watershed
110	Baptism River	Control station in different watershed

(Attachment 7 -

COMPARISON OF TALINGS BASIN WATER TO
MINNESOTA WATER QUALITY STANDARDS APPLICABLE
TO THE BEAVER RIVER AND LAKE SUPERIOR

PARAMETER	APPLICABLE MINNESOTA WATER QUALITY STANDARD OR CHRONIC TOXICITY CRITERION	MINNESOTA USE CLASSIFICATION OR EPA CRITERION	TYPICAL CONCENTRATION IN TAILINGS BASIN WATER
1. Turbidity	5 TU	1B(drinking water)	2.3
2. Arsenic	10 ug/1	1B	< 5 ug/1
3. Chlorides	50 mg/1	2A(trout water)	34 mg/1
4. Copper	10 ug/1	2A	1.9 ug/1
5. Cyanide	10 ug/1	1B	< 10 ug/1
6. Fluoride	1.5 mg/1	1B	4.1 ug/1
7. Iron	300 ug/1	1B	290 ug/1
8. Manganese	50 ug/1	1B	18 ug/1
9. Nitrates as N	10 mg/1	1B	.74 mg/1
10. Phenol	1 ug/1	1B	< 5 ug/1
11. Sulfate	250 mg/1	1B	18.2 mg/1
12. Zinc	47 ug/1	EPA(trout)	1.8 mg/1
13. Barium	1 mg/1	1B	.027 mg/1
14. Cadmium	10 ug/1	1B	.02 ug/1
15. Chromium	20 ug/1	2A	< .5 ug/1
16. Lead	.75 ug/1	EPA(trout)	.3 ug/1
17. Selenium	10 ug/1	1B	< 5 ug/1
18. Silver	50 ug/1	1B	< 1 ug/1

CONCLUSIONS:

1. Except for amphibole fibers and fluoride, the tailings basin water in the untreated state complies with Minnesota water quality standards for drinking water.

2. With the possible exception of fluoride the tailings basin water in the untreated state would not be toxic to trout for any of the parameters tabulated above. Furthermore, the MPCA staff is not aware of any other contaminant in the basin water which exceeds the concentration toxic to trout.

~1980 to Nov. 5, 1984 → ORVWS + later
Mar 7, 1988 → All waters

subp. 7 Natural Bkgd

pollutants of human activity which are comparable in nature and significance with those of natural origin. The natural background level may be used instead of the specified water quality standard as a maximum limit of the addition of pollutants, in those instances where the natural level is lower than the specified standard and reasonable justification exists for preserving the quality to that found in a state of nature.

← natural bkgd

In the adoption of standards for individual intrastate waters, the agency will be guided by the standards set forth herein but may make reasonable modifications of the same on the basis of evidence brought forth at a public hearing if it is shown to be desirable and in the public interest to do so in order to encourage the best use of the intrastate waters or the lands bordering such intrastate waters.

argument related to natural bkgd

8. Non-degradation. Waters which are of quality better than the established standards shall be maintained at high quality unless a determination is made by the agency that a change is justifiable as a result of necessary economic or social development and will not preclude appropriate beneficial present and future uses of the waters. Any project or development which would constitute a source of pollution to waters of the state shall be required to provide the best practicable control technology currently available not later than July 1, 1977 and the best available technology economically achievable not later than July 1, 1983, and any other applicable treatment standards as defined by and in accordance with the requirements of the Federal Water Pollution Control Act, 33 U.S.C. 1251 et. seq., as amended, in order to maintain high water quality and keep water pollution at a minimum. In implementing this policy, the Administrator of the U. S. Environmental Protection Agency will be provided with such information as he requires to discharge his responsibilities under the Federal Water Pollution Control Act, as amended.

9. Variance from standards. In any case where, upon application of the responsible person or persons, the agency finds that by reason of exceptional circumstances the strict enforcement of any provision of these standards would cause undue hardship, that disposal of the sewage, industrial waste or other waste is necessary for the public health, safety or welfare; and that strict conformity with the standards would be unreasonable, impractical or not feasible under the circumstances; the agency in its discretion may grant a variance therefrom upon such conditions as it may prescribe for prevention, control or abatement of pollution in harmony with the general purposes of these classifications and standards and the intent of the applicable state and federal laws. The U. S. Environmental Protection Agency will be advised of any permits which may be issued under this clause together with information as to the need therefor.

B. Water use classifications—all intrastate waters of the state. Based on considerations of best usage in the interest of the public and in conformance with the requirements of the applicable statutes, the intrastate waters of the state shall be grouped into one or more of the following classes:

expressing limitations in terms of concentration as well as mass encourages the proper operation of a treatment facility at all times. In the absence of concentration limits, a permittee would be able to increase its effluent concentration (i.e., reduce its level of treatment) during low flow periods and still meet its mass-based effluent limits. Concentration limits discourage the reduction in treatment efficiency during low flow periods, and require proper operation of treatment units at all times.

The derivation of concentration limits should be based on evaluating historical monitoring data and using engineering judgment to be sure they are reasonable. In certain situations, the use of concentration limits may not be appropriate since they may discourage the use of innovative techniques, such as water conservation by the permittee. For example, if a facility had a history of providing efficient treatment of its wastewater and also wished to practice water conservation, inclusion of concentration limits would not be appropriate (i.e., concentration limits would prohibit decreases in flow that would concurrently result in an increase in pollutant concentration). To summarize, the applicability of concentration limits should be a case-by-case determination based upon the professional judgment of the permit writer.

It should be noted that the long-term average flow should be used to calculate both the monthly average and daily maximum concentrations. The use of the long-term average flow is most appropriate for the calculation of concentration limits because it will reflect the range of concentrations that could be expected in a well operated plant. The use of the maximum daily flow is not appropriate to determine concentration limits from the mass limitations because it will reduce the concentration below the value which could be expected in a well operated plant. Alternatively, use of the lowest flow value will increase the concentration limit to levels above what would be expected in a well operated plant.

Example 1:

An industrial facility (leather tanner) is subject to effluent limitations guidelines based on its rate of production. The permit writer calculates the applicable mass-based limits based on the long-term production rate at the facility and incorporates the mass limits in accordance with 40 CFR §122.45(f)(1).

In reviewing the past inspection records for the facility, the permit writer notes that while the facility is generally in compliance with its mass limits, the effluent flow and concentration vary widely. To ensure that the treatment unit is operated properly at all times, the permit writer determines that concentration-based limits are also appropriate. The permit writer consults the EPA Development Document for the leather tanning effluent limitations guidelines and bases the concentration-based limits on the demonstrated performance of the treatment technology upon which the effluent guidelines were based. The concentration-based limits are then incorporated in the permit in accordance with 40 CFR §122.45(f)(2).

Example 2:

For Company A, the mass limits for pollutant X have been set at 260 lbs/day and 390 lbs/day monthly average and daily maximum, respectively. What are the monthly average concentration limitations in milligrams per liter (mg/l) using both an average flow of 0.9 mgd and the low flow of 0.6 mgd? Note: 8.34 is a conversion factor with the units (lbs/day)/(mgd)(mg/l).

Discussion:

Monthly average limit (based on average flow):
260 lbs/day/(8.34 x 0.9 mgd) = 35 mg/l

Monthly average limit (based on low flow):
260 lbs/day/(8.34 x 0.6 mgd) = 52 mg/l

This is almost 150 percent more than the concentration during average flow!

In determining applicable effluent concentration limitations, the monthly average and daily maximum mass limits divided by the average flow will provide appropriate concentrations.

Monthly average limit:
260 lbs/day/(8.34 x 0.9 mgd) = 35 mg/l

Daily maximum limit:
390 lbs/day/(8.34 x 0.9 mgd) = 52 mg/l

5.1.4 Best Professional Judgment Permit Limits

Best Professional Judgment (BPJ)-based limits are technology-based limits derived on a case-by-case basis for non-municipal (industrial) facilities. BPJ limits are established in cases where ELGs are not available for, or do not regulate, a particular pollutant of concern. BPJ is defined as the highest quality technical opinion developed by a permit writer after consideration of all reasonably available and pertinent data or information that forms the basis for the terms and conditions of a NPDES permit.

The authority for BPJ is contained in Section 402(a)(1) of the CWA, which authorizes the EPA Administrator to issue a permit containing "such conditions as the Administrator determines are necessary to carry out the provisions of this Act" prior to taking the necessary implementing actions, such as the establishment of ELGs. During the first round of NPDES permits in the early-to-mid-1970s, a majority of permits were based on the authority of Section 402(a)(1) of the CWA. These first round so-called best engineering judgment permits were drafted because effluent guidelines were not available for many industries. As effluent guidelines began to be promulgated, permit writers had to rely less on their best engineering judgment and could apply the ELGs in permits. As the implementation of the age of toxic pollutant

control continues, the use of BPJ conditions in permits has again become more common. However, the statutory deadline for compliance with technology-based effluent limits (including BPJ-based pollutant limits) was March 31, 1989. Therefore, compliance schedules cannot be placed in permits to allow for extensions in meeting BPJ pollutant limits.

BPJ has proven to be a valuable tool for NPDES permit writers over the years. Because it is so broad in scope, BPJ allows the permit writer considerable flexibility in establishing permit terms and conditions. Inherent in this flexibility, however, is the burden on the permit writer to show that the BPJ is reasonable and based on sound engineering analysis. If this evaluation of reasonableness does not exist, the BPJ condition is vulnerable to a challenge by the permittee. Therefore, the need for and derivation of the permit condition, and the basis for its establishment, should be clearly defined and documented. References used to determine the BPJ condition should be identified. In short, the rationale for a BPJ permit must be carefully drafted to withstand the scrutiny of not only the permittee, but also the public and, ultimately, an administrative law judge.

Establishment of BPJ Permit Limits

The NPDES regulations in 40 CFR §125.3 state that permits developed on a case-by-case basis under Section 402(a)(1) of the CWA must consider (1) the appropriate technology for the category class of point sources of which the applicant is a member, based on all available information, and (2) any unique factors relating to the applicant. To set BPJ limits, a permit writer must first determine a need for additional controls beyond existing ELGs. The need for additional controls may be the result of the facility not falling under any of the categories for which ELGs exist (e.g., barrel reclaimers, transportation equipment cleaning facilities, or industrial laundries) or discharging pollutants of concern that are not directly or indirectly addressed by the development of the ELGs (e.g., a pharmaceutical manufacturer or a petroleum refiner may discharge elevated levels of organic solvents for which category-specific guidelines do not exist). It should be noted that prior to establishing BPJ-based limits for a pollutant not regulated in an effluent guideline, the permit writer should ensure that the pollutant was not considered by EPA while developing the ELGs (i.e., BPJ-based effluent limits are not required for pollutants that were considered by EPA for regulation under the effluent guidelines, but for which EPA determined that no ELG

was necessary). Information contained in the appropriate "Development Document" should assist permit writers in making this determination.

In setting BPJ limitations, the permit writer must consider several specific factors as they appear in 40 CFR §125.3(d). These factors, which are enumerated below, are the same factors required to be considered by EPA in the development of ELGs and, therefore, are often referred to as the Section 304(b) factors:

- For BPT requirements:
  - The total cost of application of technology in relation to the effluent reduction benefits to be achieved from such application
  - The age of equipment and facilities involved*
  - The process employed*
  - The engineering aspects of the application of various types of control techniques*
  - Process changes*
  - Non-water quality environmental impact including energy requirements*
- For BCT requirements:
  - All items in the BPT requirements indicated by an asterisk (*) above
  - The reasonableness of the relationship between the costs of attaining a reduction in effluent and the effluent reduction benefits derived
  - The comparison of the cost and level of reduction of such pollutants from the discharge of POTWs to the cost and level of reduction of such pollutants from a class or category of industrial sources
- For BAT requirements:
  - All items in the BPT requirements indicated by an asterisk (*) above
  - The cost of achieving such effluent reduction.

A permit writer must consider each of these factors in establishing BPJ-based conditions in permits. Since BPJ contains an element of judgment or educated opinion, a permit writer with the proper tools should be able to establish BPJ conditions in permits that are both technically sound and reasonable.

A technically sound and reasonable permit is not likely to be successfully challenged by the permittee or a third party. In this context, "technically sound permit conditions" means that the conditions are achievable with existing technology.

"Reasonable" means that the conditions are achievable at a cost that the facility can afford. Historically, some of the other factors, such as age, process employed and non-water quality impacts have assumed lesser importance than the technical and economic feasibility evaluations.

BPJ Permitting Tools and References

Permit writers can develop BPJ limits using one of two different methods. A permit writer can either transfer numerical limitations from an existing source such as from a similar NPDES permit or an existing ELG, or derive new numerical limitations. Numerous tools and references for BPJ permit writing exist. As one gains experience drafting BPJ permits, it is common practice to rely on some references more than others. **Exhibit 5-5** lists references and provides some examples for selected BPJ data sources that have proven useful to permit writers over the years.

Most of the tools and references listed in Exhibit 5-5 can be used to derive new BPJ-based permit limits. They provide information related to the expected performance of wastewater treatment systems. For example, the *Treatability Manual*[4] and associated data base provides treatability information for over 1,400 pollutants. Information collected for use in developing effluent guidelines and standards can also provide treatability data for a significant number of pollutants and for a variety of types of industrial wastewaters. The *Technical Support Document for Water Quality-Based Toxics Control*[5] provides extensive information and guidance related to the statistical considerations when establishing effluent limits.

Since best management practices (BMPs) can also be used by permit writers as the basis for effluent limits, the *Guidance Manual for Developing Best Management Practices*[6] can be used by permit writers to identify potentially applicable BMPs that could be used for the facility to be permitted. In addition, *Storm Water Management*

[4]USEPA (1980). *Treatability Manual, Volumes I - V.* EPA-600/8-80-042a-e. Office of Research and Development.

[5]USEPA (1991). *Technical Support Document for Water Quality-Based Toxics Control.* EPA-505/2-90-001. Office of Water Enforcement and Permits.

[6]USEPA (1993). *Guidance Manual for Developing Best Management Practices.* (BMPs). EPA-833-B-93-004. Office of Water.

EXHIBIT 5-5
BPJ Permitting Tools

- Abstracts of Industrial NPDES Permits
- Treatability Manual and Data Base
- NPDES Best Management Practices Guidance Document
- Guidance Manual for Developing Best Management Practices (BMPs). EPA 833-B-93-004. (USEPA, 1993) Office of Water and Storm Water Management for Industrial Activities: Developing Pollution Prevention Plans and Best Management Practices. EPA 832-R-92-006. (USEPA, 1992) Office of Water.
- Technical Support Document for the Development of Water Quality-based Permit Toxic Control
- Workbook for Determining Economic Achievability for NPDES Permits
- National Environmental Investigation Center reports on specific facilities
- Toxicity reduction evaluations for selected industries
- Industry experts within EPA Headquarters, Regions, and States
- Effluent guidelines development information
  - CWA Section 308 questionnaires
  - Screening and verification data
  - Development documents
  - Contractor's reports
  - Proposed regulations
  - Project Officers
- Permit Compliance System data
- Permit/compliance file information
  - Previous NPDES application forms
  - Discharge Monitoring Reports
  - Compliance Inspection reports
- Other media permit files (e.g., Resource Conservation and Recovery Act (RCRA) permit applications and Spill Prevention Countermeasure and Control (SPCC) plans)
- Literature (e.g., technical journals and books).

for Industrial Activities: Developing Pollution Prevention Plans and Best Management Practices[7] can be used by permit writers responsible for establishing BPJ permit limits for storm water discharges.

[7]USEPA (1992). *Storm Water Management for Industrial Activities: Developing Pollution Prevention Plans and Best Management Practices.* EPA 832-R-92-006. Office of Water.

To assist permit writers in identifying other NPDES permits from which technology-based effluent limits can be transferred, EPA has developed the *NPDES Industrial Permit Abstracts*[8]. The abstracts are a compilation of NPDES permits issued by authorized State agencies and EPA Regional offices to a variety of non-municipal dischargers. The abstracts assist permit writers by providing rapid access to permit information in a standardized, cross-referenced and easy-to-read format.

As previously discussed, permit writers must consider the costs to comply when establishing BPJ permit limits for toxic and nonconventional pollutants. To assist permit writers in determining whether the estimated costs are reasonable for the facility to be permitted, a draft document, *Workbook for Determining Economic Achievability for National Pollutant Discharge Elimination System Permits*[9], has been developed. This guidance document provides a step-by-step procedure for permit writers to determine the economic achievability of BPJ effluent limits.

BPJ Statistical Considerations

The quality of the effluent from a treatment facility will normally vary over time. If BOD_5 data for a typical treatment plant are plotted against time, the day-to-day variations of effluent concentrations can be seen. Some of this behavior can be described by constructing a frequency-concentration plot. From this plot, one can see that for most of the time, BOD_5 concentrations are near some average value. Any treatment system can be described using the mean concentration of the parameter of interest (i.e., the long-term average) and the variance (or coefficient of variation) and by assuming a particular statistical distribution (usually lognormal).

Permit limits are generally set at the upper bounds of acceptable performance. As required at 40 CFR §122.45(d), two expressions of permit limits are required—an average monthly limit and a maximum daily limit. The use of average and maximum limits can vary depending on the effluent guidelines and water quality criteria that are consulted. Instantaneous maximums, daily averages and daily maximums, weekly averages, and monthly averages are all commonly used limitation expressions.

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[8]USEPA (1993). *NPDES Industrial Permit Abstracts 1993.* EPA-833/B-93-005. Office of Water.

[9]USEPA (1982). *Workbook for Determining Economic Achievability for National Pollutant Discharge Elimination System Permits* (DRAFT). Permits Division Prepared by Putnam, Wayes & Bartlett, Inc.

Generally, the definitions are consistent with those set forth in the Glossary of this manual.

If permit limits are set too lenient relative to the long-term average, a discharger not complying with expected performance will not exceed the limits. If permit limits are set too stringently, a discharger that is complying with expected performance may frequently exceed the limits. It is important to note that statistical variability is already built in with respect to the ELGs, and the permit writer may not perform a separate evaluation in those cases where a permit limitation is derived from a guideline.

When developing a BPJ limit, permit writers can use an approach consistent with EPA's ELG statistical approach. Specifically, the daily maximum limitation can be calculated by multiplying the long-term average by a daily variability factor. The monthly maximum limitation can be calculated similarly except that the variability factor corresponds to the distribution of monthly averages instead of daily concentration measurements.

The daily variability factor is a statistical entity defined as the ratio of the estimated 99th percentile of a distribution of daily values divided by the mean of the distribution. Similarly, the monthly variability factor is typically defined as the estimated 95th percentile of the distribution of 4-day averages divided by the mean of the monthly averages.

A modified delta-lognormal distribution can be fit to concentration data. Variability factors can then be computed for a facility distribution. The modified delta-lognormal distribution models the data as a mixture of non-detect observations and measured values. This distribution is often selected because the data for most analytes consists of a mixture of measured values and non-detects. The modified delta-lognormal distribution assumes that all non-detects have a value equal to the detection limit and that the detected values follow a lognormal distribution.

For more details on EPA's use of statistical methods for developing ELGs, refer to *Development Document for Effluent Limitations Guidelines and Standards for the*