

STATE OF MINNESOTA

MINNESOTA POLLUTION

COUNTY OF RAMSEY

CONTROL AGENCY

In the Matter of the Proposed
Revision of Minn. Rule Part
7050.0210 Subpart 6 Relating
to the Fecal Coliform Effluent
Limitation

STATEMENT OF NEED
AND REASONABLENESS

I. INTRODUCTION

Minnesota Rules Chapter 7050 are the rules of the Minnesota Pollution Control Agency (hereinafter "Agency") that define use classifications and water quality standards for all waters of the state, establish minimum effluent requirements for all dischargers, and assign use classifications to all waters of the State. Minnesota Rule Part 7050.0210 Subpart 6 specifies the effluent limitations that all dischargers in Minnesota must meet as a minimum level of wastewater treatment. One of the limitations in this subpart is for fecal coliform bacteria. This limitation is applicable to all discharges, municipal and industrial, that contain sewage or other sources of pathogenic organisms.

The subject of this statement is the proposed modification of the fecal coliform (FC) effluent limitation. The proposed changes would delete two requirements in the FC limitation that are excessively restrictive and inconsistent with current Agency permitting and enforcement policy. The primary reason for proposing these changes is to prevent the excessive use of chlorine disinfectant by dischargers. If dischargers were to fully comply with the current FC limitation, in all probability,

more chlorine would be used by dischargers than is necessary to maintain the fecal coliform water quality standard. The fecal coliform water quality standard will not be jeopardized if the proposed changes take place, and a minimization of the amount of chlorine added to Minnesota's receiving streams represents an environmental benefit and a cost savings for dischargers.

The Agency's authority to adopt and amend water quality standards including effluent limitations is found in Minnesota Statute § 115.03 subdivisions 1(e) and Minnesota Statute § 115.44 subdivisions 4 and 5(e).

This statement contains the Agency's affirmative presentation of facts on the need for and reasonableness of the proposed amendment. The Agency staff does not anticipate opposition to the proposed change and suggests that the amendment be accomplished through the noncontroversial rulemaking procedure. The proposed change will not mean additional costs to any discharger, municipality or small business. In fact, if the present FC effluent limitation requirements are retained, and subsequently fully enforced by the Agency, dischargers will incur additional costs that they would not incur under the proposed amendments. These additional costs would result from the increased use of chlorine and the increased frequency of effluent monitoring by all but the largest municipal dischargers.

The Agency published a notice to solicit outside public opinion in the State Register on October 22, 1984 (attachment 1). The deadline for receipt of comments was November 9, 1984. A representative of the Citizens for a Better Environment inquired

about the proposal over the phone on October 31, 1984 but did not offer any specific comments. The Metropolitan Waste Control Commission (MWCC) submitted a letter, and comments on November 21, 1984. The MWCC endorsed the proposed change and submitted data that supports the reasonableness of the change. These data are discussed later in this document.

The Agency Board Rules Committee considered the proposed changes on September 24, 1984 and recommended that the proposal be submitted to the full Board.

The current FC effluent limitation is one of several limitations that define secondary treatment in Minnesota Rule 7050.0210 Subpart 6. The current limitation is quoted below:

Fecal Coliform Group Organisms***	200 organisms per
	100 milliliters

***Disinfection of wastewater effluents to reduce the levels of fecal coliform organisms to the stated value is required from March 1 through October 31 (Class 2 waters) and May 1 through October 31 (Class 7 waters) except that where the effluent is discharged 25 miles or less upstream of a water intake supplying a potable water system, the reduction to the stated value is required year around. The stated value is not to be exceeded in any calendar month as determined by the logarithmic mean of a minimum of five samples, nor shall more than ten percent of all samples taken during any calendar month individually exceed 400 organisms per 100 milliliters. The application of the fecal coliform group organism standards shall be limited to sewage or other effluents containing admixtures of sewage and shall not apply to industrial wastes except where the presence of sewage, fecal coliform organisms or viable pathogenic organisms in such wastes is known or reasonably certain. Analysis of samples for fecal coliform group organisms by either the multiple tube fermentation or the membrane filter techniques is acceptable.

The above FC limitation contains three elements: 1) a monthly logarithmic mean of 200 organisms per 100 ml, 2) a requirement that no more than ten percent of the monthly samples individually can exceed 400 organisms per 100 ml, and 3) a requirement that at least five samples be taken per month. It is elements 2) and 3) in the limitation that the Agency staff is proposing to delete. The Agency staff proposes to reword the second sentence in the triple asterisk footnote above as follows:

The stated value is not to be exceeded in any calendar month as determined by the logarithmic mean of a ~~minimum-of-five-samples, nor shall more than ten percent-of-all-samples-taken-during-any-calendar-month individually-exceed-400-organisms-per-100-milliliters~~ all the samples collected in a given calendar month.

The 200 organisms per 100 ml monthly log mean requirement is not proposed for change. Also no change is proposed for the fecal coliform water quality standards in Minnesota Rule Part 7050.0220 Subparts 2 and 7.

The water quality standard for fecal coliform organisms for class 2 waters is as follows:

200 organisms per 100 milliliters as a logarithmic mean measured in not less than five samples in any calendar month, nor shall more than 10% of all samples taken during any calendar month individually exceed 400 [for Class 2A waters, 2000 for Class 2B and 2C waters] organisms per 100 milliliters. (Applies only between March 1 and October 31.)

The water quality standard for fecal coliform organisms for class 7 waters is as follows:

1000 organisms per 100 milliliters (applies only between May 1 and October 31.) The stated value is not to be exceeded in any calendar month as determined by the logarithmic mean of a minimum of five samples, nor shall more than ten percent of all samples taken during any calendar month individually exceed 2000 organisms per 100 milliliters.

II. NEED FOR AMENDMENT

The Agency has recently completed revisions to its water quality rules (Minnesota Rule Chapter 7050). The amendment proposed herein dates back to changes made in the FC effluent limitation during the previous revisions completed in 1981. However, the need for proposed change only became apparent to the Agency staff at the time the most recent amendments were being finalized. The Agency staff feels it is important to make the proposed change now rather than wait until its regular triennial review and revision of water quality standards which is now three years away. The proposed change is needed partly to bring the current rule into agreement with established Agency permitting and enforcement policy, and partly to prevent the increased discharge of chlorine into waters of the state.

III. REASONABLENESS OF THE AMENDMENT

A. Introduction

This section describes the Agency's reasons for suggesting the changes in the fecal coliform effluent limitation that the Agency is proposing to make.

The purpose of the fecal coliform effluent limitation is to control the discharge of pathogenic organisms that are potentially found in domestic wastewater. Few fecal coliform bacteria are pathogenic but high counts of fecal coliforms in water are an indication of fecal contamination and the possible presence of human pathogens. Thus, the effluent limitation is intended to protect persons using surface waters for contact recreation such as swimming during which the ingestion of small quantities of water is possible. The Agency staff is confident that these recreational uses will still be fully protected under the proposed amended FC effluent limitation. The fecal coliform water quality standards will not be changed.

Dischargers usually achieve compliance with the FC effluent limitation by disinfecting the wastewater with chlorine. However, the use of chlorine has negative side effects. The Agency staff is concerned about the excessive or unnecessary use of chlorine. Some of the amendments to the water quality standards proposed in 1980 helped reduce chlorine use. The amendments to the FC limitation proposed herein should help reduce it further, or at least prevent unnecessary increased use in the future.

B. Proposed Deletion of the Not to Exceed 400 Organisms Per 100 ml in Ten Percent of Monthly Samples Requirement.

Full implementation of the requirement in the FC effluent limitation that no more than ten percent of the samples taken in one month can exceed 400 organisms per 100 ml (hereinafter shortened to 400/ten percent) would have negative effects that

were not anticipated at the time the limitation was proposed. In fact, this requirement has not been implemented by the Agency staff since it was enacted in 1981 because of delays and objections to revised fecal coliform permit conditions. The Agency staff is concerned that the rigid enforcement of the 400/ten percent requirement now would lead to additional use of chlorine by dischargers. Data from three sources, discussed below, support this assumption.

First, discharge monitoring reports (DMR), submitted to the Agency on a monthly basis by all permitted dischargers, contain information on the quality of a discharger's effluent. A sample of DMRs were reviewed to determine whether the 200 organisms per 100 ml monthly log mean (200/mean) or the 400/ten percent requirement is the most stringent. Whichever of these requirements is the most stringent will control the amount of chlorine used to achieve compliance. A sample of ten communities with Class A plants and ten communities with Class B¹ (see footnote next page) plants were selected at random. For each plant selected the monthly DMRs were reviewed for the period January 1983 to October, 1984. The number of months with violations of the 200/mean limitation and the 400/ten percent limitation were recorded. The results are shown in the table below.

Number of Monthly Violations of the 200/Mean
Versus the 400/Ten Percent Requirements in the
FC Effluent Limitation

	<u>Class A Plants</u>	<u>Class B Plants</u>
Violations of the 200/ mean requirement	3	13
Violations of the 400/ 10% requirement	20	20
Total number of months reviewed	135	138

The results show that the 400/ten percent requirement is violated more frequently than the monthly mean requirement especially in Class A plants. This indicates that the 400/ten percent requirement is more restrictive and will very likely control the amount of chlorine used by dischargers to achieve compliance with their permit limitations.

Secondly, effluent fecal coliform data submitted by the MWCC with their comments show much the same thing. Their analysis of the distribution of effluent fecal coliform values at ten MWCC plants shows that to achieve acceptable compliance with the 400/ten percent requirement the effluent would have to meet a monthly mean fecal coliform value of only 16 organisms per 100 ml. This is far more stringent than the allowable 200 organisms per 100 ml as a monthly mean. The implication of this is that

1 Municipal wastewater treatment plants are categorized as Class A, B, C, or D based on the size and sophistication of the plant and other factors. As of July, 1983 there were 34 Class A, 55 Class B, 159 Class C and 266 Class D municipal or sanitary district wastewater treatment plants with certified operators in Minnesota. Class D plants are nearly all stabilization pond systems.

considerably more chlorine would be needed to comply with the 400/ten percent requirement than would be needed to comply with the 200/mean requirement. This conclusion is supported further by fecal coliform and chlorine data from the Metro Plant effluent analyzed by MWCC. From this analysis MWCC is able to predict that the amount of chlorine required to achieve 200 organisms per 100 ml in the Metro Plant effluent compared to 16 organisms per 100 ml would be 1.16 mg/l and 5.98 mg/l, respectively (assuming a prechlorination fecal coliform population of 10^5). This indicates that five times as much chlorine would be needed to meet the 400/ten percent requirement as is needed to meet the 200/mean requirement.

Thirdly, the MWCC has conducted chlorine optimization studies at some of their plants. The purpose of these studies was to establish the minimum amount of chlorine that must be used to comply with their FC effluent limitation. Data from the Anoka Plant can be used to illustrate the effect the various FC limitations have on chlorine use. The FC effluent limitations in the Anoka permit are 200 organisms/per 100 ml as a 30-day log mean and 400 organisms per 100 ml as a 7-day log mean. In addition, the chlorine amount needed to meet the 400/ten percent requirement, if it were to be imposed, can be determined. The results are shown in the table below.

Chlorine Required to Achieve Compliance
with Fecal Coliform Effluent Limitation
Requirements at the Anoka Plant¹

<u>Effluent Requirement</u>	<u>Chlorine Amount</u>
30-day mean of 200	3.7 mg/l
7-day mean of 400	5.1 mg/l
400/ten percent	7.8 mg/l

As these results show more than twice as much chlorine is required to meet the 400/ten percent requirement than is needed to meet the 200/mean requirement.

It is clear from these data that the potential for increased chlorine use is very real if the 400/ten percent requirement is to be enforced.

Besides being unnecessarily stringent, the 400/ten percent requirement is not consistent with the realities of wastewater treatment plant monitoring frequencies. For this requirement to have real meaning, wastewater treatment plant operators should sample their effluent at least ten times per month for fecal coliform bacteria. Only Class A major facilities are required to collect ten or more samples per month. All other facilities are required to monitor for fecal coliforms twice weekly or less (see attachment 2). The monitoring frequencies set for the various

¹ Brice Pickart of MWCC, personal communication.

class plants is established Agency policy that has changed little since the early 1970s. For the plants that monitor for fecal coliforms less than ten times a month, which is the vast majority, a single value over 400 organisms per 100 ml represents a violation of the 400/ten percent requirement. To keep from ever exceeding 400 organisms per 100 ml, plant operators may be inclined to use excessive chlorine.

C. Proposed Deletion of the Five Samples Per Month Requirement.

Already discussed above is the fact that established Agency policy has for years permitted small dischargers to sample for fecal coliform bacteria less than five times per month. This level of monitoring has been considered adequate for the Agency staff to ascertain compliance for the small discharger.

Dischargers will continue to report the results of their fecal coliform and total residual chlorine monitoring as they have in the past. The proposed change will codify what has been Agency practice for some time.

If all dischargers were required to sample at least five times per month, monitoring costs for the small communities with Class B minor or Class C plants would increase. Affected most would be the smallest of these communities. Their monitoring costs for fecal coliforms could increase by as much as 500 percent because some now sample just once per month. Consulting analytical labs that typically analyze effluent samples for the smaller dischargers, charge in the neighborhood of six to ten dollars for a fecal coliform analysis.

D. Protection of the Fecal Coliform Water Quality Standard.

Since the proposed change to the FC effluent limitation will, for the most part, bring the rule into line with existing practice and policy, the change should have little if any impact on water quality. Future NPDES permits would no longer include the 7-day log mean of 400 organisms per 100 ml limitation, but will retain the monthly log mean of 200 organisms per 100 ml limitation. The MWCC data discussed previously suggest that the latter is a slightly less restrictive requirement than the former. Thus, the potential for an occasional high fecal coliform value in the effluent may be greater under the proposed limitation. The Agency staff feels, however, that this potential for a higher fecal coliform value is more than offset by the "environmental gain" of reducing chlorine usage.

As mentioned before, the Agency is confident that the fecal coliform water quality standards and the beneficial uses these standards are intended to protect will not be jeopardized by the proposed amendment. One purpose of effluent limitations is to protect downstream water quality standards. If it becomes apparent that the proposed FC limitation is not protecting the water quality standards downstream of any discharge, a more restrictive effluent limitation could be imposed on that discharger.

E. Advantages of Reducing Chlorine Usage.

The toxicity of chlorine to fish and other aquatic organisms has been thoroughly documented. The Agency reviewed the chlorine toxicity literature when it adopted the water quality standard

for total residual chlorine of 5 ug/l in 1981 (Minnesota Pollution Control Agency 1980). The U.S. Environmental Protection Agency (U.S. EPA) has recently published a draft chlorine criterion document in which they propose a criterion of 6.6 ug/l (U.S. EPA 1984). The basis for these numbers is a large body of toxicity tests and studies on both the acute and chronic effects of chlorine on aquatic life. Some of these studies have shown, through field tests, that the absence of fish in receiving streams below a municipal discharge is due more to the chlorine in the discharge than to the other pollutants (Tsai 1968, Michigan Department of Natural Resources 1971, Paller et. al. 1983). Thus, there is no question that chlorine is highly toxic to aquatic life and does have an impact on the communities of aquatic organisms in receiving streams.

Another aspect of the chlorination of wastewater that has received substantial attention is the formation of organochlorine compounds through the bonding of chlorine with organic compounds either in the effluent or receiving stream. A large number of chlorinated compounds have been found such as the chlorinated methanes, benzenes, and phenols. Some of these compounds are toxic to fish and other aquatic organisms, some can impart unpleasant tastes to fish flesh, and some are mildly bioaccumulative. Others such as chloroform are suspected human carcinogens (U.S. EPA 1975 and NRCC 1978). The reduction of chlorine usage will not eliminate this problem but it will reduce its magnitude. The reduction of chlorine usage whenever possible has demonstrated environmental benefits and has been strongly

recommended by the Comptroller General of the United States (U.S. Comptroller General 1977).

IV. CONCLUSION

This document with attachments constitutes the Agency's Statement of Need and Reasonableness for the amendment being proposed to Minnesota Rule Part 7050.0210 Subpart 6. The Agency believes that it has made a presentation establishing the need for and the reasonableness of the amendment being proposed.

V. LITERATURE CITED

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Respectively Submitted,

Thomas J. Kalitowski
Executive Director
Minnesota Pollution Control Agency

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