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February 25, 2002

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STATE OF ILLINOIS
Pollution Control Board

Illinois Pollution Control Board
Docket Clerk
James R. Thompson Center
100 West Randolph Street
Suite 11-500
Chicago, Illinois 60601

Subject: Prefiled Testimony of Mr. Michael Zima
Docket No. R02-19

Attn: Docket Clerk:

Enclosed please find the testimony of Mr. Michael Zima to be presented at the Illinois Pollution Control Board (IPCB) Meeting of March 25, 2002. This IPCB meeting is scheduled for 10:30 a.m. and will take place at the James R. Thompson Center in Chicago. The testimony will be in the matter of the Illinois Association of Wastewater Agencies petition before the IPCB regarding ammonia-nitrogen water quality standards in Docket Number R02-19.

Please be aware that I have served copies of the enclosed testimony with all persons on the existing service list for R02-19.

If you have any questions, please call me at 815-758-3513.

Very truly yours,



Michael Zima
District Manager

Cc: M. Callahan
D. Zenz
D. Schmidt

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STATE OF ILLINOIS
Pollution Control Board

TESTIMONY PRESENTED TO THE
ILLINOIS POLLUTION CONTROL BOARD
IN THE MATTER OF:

PETITION OF THE
ILLINOIS ASSOCIATION OF WASTEWATER AGENCIES
WATER QUALITY STANDARDS
AMMONIA-NITROGEN

DOCKET NUMBER: R02-19

MARCH 25, 2002

BY

MR. MICHAEL ZIMA
DISTRICT MANAGER
DEKALB SANITARY DISTRICT

Introduction

The Illinois Association of Wastewater Agencies (IAWA) has filed a petition before the Illinois Pollution Control Board (IPCB). In this petition, the IAWA has proposed a change to Parts 302 and 304 of the existing IPCB Water Quality Standards for Ammonia. The IAWA Petition has been assigned Docket Number R02-19 by the IPCB and public hearings on this petition are in progress.

The impetus and genesis for the IAWA petition is the United States Environmental Protection Agency (USEPA) 1999 Update of Ambient Water Quality Criteria for Ammonia (EPA-822-R-99-014) which was released in the Federal Register on December 22, 1999 (Vol. 64, No. 245, Pages 71974-71980). In the 1999 update, USEPA took note of the fact that additional information has been gathered since it published its Ambient Water Quality For Ammonia in 1984. Based upon the additional information, USEPA prepared the 1999 update which contained revised freshwater quality criterion for ammonia. The IAWA petition essentially asks the IPBC to enact into Illinois Regulation, USEPA's 1999 Update of Ambient Water Quality Criteria for Ammonia.

The USEPA has spent considerable effort in issuing the 1999 update and the states are expected to adopt numeric water quality criterion for ammonia based upon the 1999 update. Protective criteria for ammonia are expected to be adopted in all states not later than 2004.

The DeKalb Sanitary District

The DeKalb Sanitary District (DSD) was created on July 12, 1928 and for the past nearly 74 years has provided wastewater collection and treatment and biosolids management for its Northern Illinois service area. By 1929, the DSD provided primary and secondary treatment to its entire service area. Since 1929, the DSD has continuously upgraded its treatment facilities. In 1981, DSD provided second stage biological treatment to remove ammonia-nitrogen from its effluent. Also in 1981, tertiary sand filtration was added which greatly reduced the suspended solids and oxygen demand of the DSD's discharge. In 1984, DSD constructed a new facility to treat excess flows during peak flow periods. Most recently in 1997, the DSD added a new single stage activated sludge nitrification (ammonia removal) facility to handle additional flows from its service area. A new headworks was also constructed in 1997 to upgrade the raw sewage pumping and flow measurement capabilities of the DSD's treatment plant.

Since 1981, the DSD has spent nearly 20 million dollars to provide modern wastewater treatment to the nearly 40,000 people in the service area. Today the DSD provides complete secondary and tertiary treatment and biological nitrification (ammonia removal) before discharge to the South Branch of the Kishwaukee River.

Testimony of the DeKalb Sanitary District

The testimony of the DSD before the IPCB will focus on the discharge permit limits which will be imposed upon the DSD based upon IPCB's existing water quality standards for ammonia-nitrogen and the economic impact of these regulations. Also the DSD will discuss the permit

limits which would be imposed if the IAWA petition were to be enacted and the impact of such enactment on the DSD.

The DSD believes that it is important for the IPCB to understand the economic impact of its existing ammonia-nitrogen regulations on publicly owned treatment works (POTWs) and how the IAWA petition would affect this impact.

IPCB Ammonia-Nitrogen Water Quality Standards

The IPCB in December 1996 [R94-1(B)] adopted the existing State of Illinois ammonia-nitrogen and un-ionized ammonia standards. The IPCB 1996 water quality standards were in response to the development of the USEPA's National Criteria Document for Ammonia in 1984. Because of the release of USEPA's 1999 update, it seems entirely logical for the IPCB to consider a significant change in its 1996 water quality standards for ammonia.

The USEPA's 1999 Update of Water Quality Criteria for Ammonia was published only after an extensive review of the scientific literature. Upon releasing the 1999 update, USEPA stated, "These criteria reflect the latest scientific knowledge on the effects water pollutants have on the public health and welfare, aquatic life and recreation. The 1999 update contains EPA's most recent freshwater aquatic life criteria for ammonia and supercedes all previous freshwater aquatic life ammonia criteria. The new criteria reflect recent research and data since 1984 and are a revision of several elements in the 1984 criteria..."

The DSD believes that the IAWA has made an honest and scientifically defensible adaptation of the 1999 update to fit the situation here in Illinois. The IAWA has had the petition reviewed by the IEPA and they are in concurrence with it.

The DSD believes that the IAWA petition should be adopted in its present form. The petition accurately reflects the USEPA's 1999 update and therefore represents the latest scientific knowledge. We urge the IPCB to enact the IAWA petition.

DeKalb Sanitary District National Pollutant Discharge Elimination System (NPDES) Permit Limits

The existing NPDES permit for the DSD was issued on December 12, 2000. The IEPA issued this permit after finalizing its Part 355 procedures for ammonia-nitrogen. These IEPA procedures were issued on July 1, 1999.

For the period of December 2000 through December 2003, the NPDES permit requires the DSD to meet the following ammonia-nitrogen limits.

CONCENTRATION, Mg/l		
AMMONIA-NITROGEN		
Season	Monthly Average	Daily Maximum
April-October	1.5	3.0
November-March	3.6	7.2

These limits are the same ammonia-nitrogen limits that have been in previous NPDES permits for DSD.

Special Condition 16 of DSD's NPDES permit states that by December 2003, the DSD must meet the following ammonia-nitrogen permit limits:

CONCENTRATION, Mg/l		
AMMONIA-NITROGEN		
Season	Monthly Average	Daily Maximum
April-October	1.3	3.0
November-March	1.2	5.1

The December 2003 permit limits are based upon the IPCB water quality standards adopted in 1996 and the Part 355 procedures adopted by the IEPA in 1999. Those NPDES permits which expired after July, 1999 contains limits based upon the 1996 IPCB standards and the 1999 IEPA procedures. Those who could not comply with the new limits were given three years to comply. Hence the DSD now has a December 2003 compliance date in its NPDES permit.

DSD's Alternatives to Meet the December 2003 Permit Limits

In order to meet the December 2003 permit limits for ammonia-nitrogen, the DSD is considering a variety of alternatives. The DSD has retained Consoer Townsend Envirodyne Engineers Inc. (CTE) to study and select the most cost-effective alternative or alternatives which can meet the December 2003 limits.

Biological Nitrification (ammonia removal)

Almost without exception, POTWs in Illinois remove ammonia from wastewater using biological nitrification. In essence, nitrifying bacteria contained in biological reactors convert the toxic ammonia to non-toxic nitrates before discharge. But the biological nitrification reaction is somewhat difficult to control and it is often not always possible to consistently achieve levels of ammonia-nitrogen below 1.5 mg/l.

In the IPCB hearing on R94-1(B), the IEPA (Mr. Dean Studer, November 10, 1994) testified that biological nitrification is capable of consistently achieving a monthly average ammonia-nitrogen concentration of 1.5 mg/l from April-October and 4.0 mg/l, November-March. It was for this reason that in R94-1 (B), the IPCB decided to establish the concept of effluent modified waters (EMW). EMWs are waters downstream from a wastewater treatment plant that, at a minimum, can comply with a summer monthly average of 1.5 mg/l from April through October and a winter monthly average of 4.0 mg/l during November-March. EMW's continue downstream of the facility, the distance that it takes for the chronic ammonia standards to be met.

The DSD must essentially comply with a monthly average ammonia-nitrogen permit limit by December 2003 of 1.2-1.3. mg/l, year round. The DSD employs biological nitrification and meets its existing NPDES permit limits of 1.5 mg/l April-October and 3.6 mg/l, November-March. But the December 2003 limits cannot be consistently met with the biological nitrification systems currently in place.

This non-compliance with the 1996 IPCB standards using biological nitrification is not atypical. In fact the IEPA stated in testimony on R94-1(B) that at least 19 facilities in Illinois were at risk of non-compliance if the 1996 IPCB standards were adopted. The IEPA indicated in its testimony that most of the 19 facilities will have to be redesigned to meet the proposed standards.

Alternatives to Reduce Ammonia-Nitrogen in DSD's Effluent

DSD's Consultant (CTE Engineers) is currently considering the following alternatives to reduce effluent ammonia-nitrogen in order to comply with its December 2003 permit limits:

- 1) Ion Exchange
- 2) Breakpoint Chlorination
- 3) Improvements in Fixed Film Bioreactors
- 4) Automatic Dissolved Oxygen Control for the Single Stage Nitrification System

Ion Exchange

Ion exchange involves passing a liquid through a column or bed of specific natural or synthetic resin and the exchange of one ion for another. Clinoptilolite is the resin of choice for ammonia-nitrogen removal. Ammonia-nitrogen concentrations of 0.5 to 1.0 mg/l are possible with this technology.

The 5 mgd North Tahoe-Truckee Wastewater Treatment Plant has used ion exchange to treat its discharge to Lake Tahoe since the 1970's.

Ion exchange is a workable but an extremely demanding operation. The resin must be frequently acid washed to remove scale formation. About 20% of the resin must be replaced per year. The resin regeneration process presents a extremely corrosive environment dictating special safety concerns. The equipment is also difficult to maintain, repair and replace. Operational care is particularly important in terms of preventing ammonia salt crystallization formation which can contaminate the resins.

For the DSD, the capital cost for ion exchange treatment plant to reduce ammonia-nitrogen levels below 1.5 mg/l would cost approximately 20 million dollars and annual operating costs could exceed \$600,000 dollars per year.

Breakpoint Chlorination

Breakpoint chlorination involves adding sufficient chlorine to a wastewater to oxidize the ammonia present. Most of the ammonia-nitrogen is converted to nitrogen gas by the reaction with chlorine. It normally takes about 10 mg/l of chlorine to remove 1 mg/l of ammonia-nitrogen. Dechlorination of the effluent is necessary because of residual chlorine present at the end of the breakpoint reaction.

The most obvious advantage of breakpoint chlorination is that it involves technology which is normally present at a POTW. Most POTW's practice chlorination/dechlorination for their effluent disinfection process.

For the DSD, its existing chlorination/dechlorination system could be modified to employ breakpoint chlorination. The need for breakpoint chlorination would be present about 50 to 100 days per year when about 10 mg/l of chlorine would be added on average to reduce ammonia levels in DSD's effluent. The Capital costs for the modification to DSD's existing chlorination system would exceed about \$400,000 while the annual operating costs would total about \$100,000.

The principal disadvantage of breakpoint chlorination is the formation of chloramines and trihalomethanes which are discharged with the effluent. As with any chlorination system there also are worker safety issues which must be continuously addressed.

Improvements in Existing Fixed Film Bioreactors

One of the biological nitrification systems now employed by DSD is a fixed film biological reactor system for nitrification. It is possible that a change in the influent system for this biological reactor could result in a greater removal of ammonia-nitrogen. But there is no guarantee that such a change will produce a lower effluent ammonia concentration. The changes required in the influent structures involve adding new pumps and a new piping system to distribute influent flow more equally to the individual components of the fixed film reactors. This system would only be used periodically but could improve the biological nitrifying population present in the

reactors. The capital cost would be about \$50,000 and the operating costs would total more than \$10,000.

Automatic Dissolved Oxygen Control

The DSD is using a single stage activated sludge process to treat a portion of its wastewater flow. This biological nitrification system could possibly be improved by the addition of automated dissolved oxygen (DO) control. The system would automatically respond to changes in the oxygen demand of the wastewater and this could possibly improve the nitrifying organism population in the activated sludge process. The capital cost for the system would be about \$50,000 and annual operating costs would exceed \$40,000.

Screening of Alternatives

The DSD's study of ammonia reduction alternatives continues and a final decision has not been reached as to which alternatives will be selected for implementation. The IPCB should bear in mind that the costs presented here are preliminary and are subject to revision as the study of alternatives continues. However the costs are sufficiently accurate to give a reasonable approximation of the final costs that could be incurred by DSD.

It seems probable that DSD will ultimately decide to implement more than one of the four alternatives presented here. Therefore the IPCB should not think that the cost of any single alternative represents the DSD's cost of complying with the 1996 IPCB regulations.

Impact of the IAWA Petition

The IAWA petition would result in the following effluent permits limits for the DSD:

CONCENTRATION, Mg/ AMMONIA-NITROGEN		
Season	Monthly Average	Daily Maximum
March-October	1.5	6.7
November-February	4.0	6.7

Obviously the IEPA would make the final decision as to the permit limits for the DSD. However, the above permit limits are based upon the stream (South Branch of the Kishwaukee) data used by the IEPA to determine the ammonia limits in DSD's existing NPDES permit. Therefore these above permit limits are a reasonable prediction.

As can be seen, these permit limits are very similar to the permit limits now in effect for DSD's treatment plant. DSD can meet these permit limits with its existing biological nitrification systems and would not incur the capital and operating costs outlined above for the four ammonia-nitrogen alternatives currently being considered by DSD.

Summary and Recommendations

The DSD believes that the IAWA petition represents a sensible and scientifically based adaptation to the State of Illinois of the USEPA's 1999 Update of Ambient Water Quality Criteria for Ammonia. This update represents USEPA's assessment of credible scientific data on the aquatic life toxicity of ammonia. The DSD recommends that the IPCB enact the IAWA petition so that the most scientifically defensible water quality standards can be used to protect aquatic-life in the state of Illinois.

The DSD could potentially spend more than 20 million dollars in capital costs and more than \$750,000 in annual operating costs to meet the existing IPCB standards for ammonia as finalized in R94-1(B). If the IAWA petition is enacted, DSD would not be required to expend these funds. The significant installation and annual operating costs associated with the various ammonia reduction options are by no means inconsequential for the DeKalb Sanitary District or its service population, especially in light of the USEPA's 1999 Update of Water Quality Criteria for Ammonia and the subsequent IAWA petition.

We are hopeful that the forgoing is of some value to the IPCB's decision process regarding this matter. Again, DSD recommends that the IPCB enact the IAWA petition.