ILLINOIS POLLUTION CONTROL BOARD
February 4, 1982

IN THE MATTER OF:	)	
	)	
AMENDMENT OF CHAPTER 3: RULE 203(f), WATER POLLUTION, AMMONIA NITROGEN WATER QUALITY STANDARD	)	R81-23

Proposal for Rulemaking.

PROPOSED OPINION AND ORDER OF THE BOARD (by J.D. Dumelle):

This matter comes before the Board upon the July 13, 1981 filing of an economic impact study by the Institute of Natural Resources (now the Department of Energy and Natural Resources) entitled "Economic Impact of Existing Ammonia Nitrogen Water Quality Standard, Illinois Pollution Control Board Chapter 3, Rule 203(f)" and designated as Document 81/23. In response to that filing the Board scheduled three hearings in the nature of "inquiry" hearings to evaluate that study and to gather other evidence to determine whether sufficient reason exists to propose modification or deletion of Rule 203(f). Those hearings were held on October 23, 1981 (in Chicago), November 3, 1981 (in Springfield), and November 12, 1981 (in Salem). Notice of these hearings was given in accordance with Section 28 of the Environmental Protection Act (Act) and appeared in Environmental Register #244 (September 21, 1981). The comment period was held open until January 18, 1981.

REGULATORY BACKGROUND

Upon a March 7, 1972 Opinion (R70-8, R71-14 and R71-20, 3 PCB 755) and an April 4, 1972 Order of the Board (R71-14, 4 PCB 3), the Board adopted the Rule 203(f) ammonia nitrogen water quality standard of 1.5 mg/l based upon the "Green Book" recommendation for protection of aquatic life. This rule was more stringent than the previous 2.5 mg/l standard under SWB-8 which had been adopted by the Sanitary Water Board (one of the predecessors of the Pollution Control Board).

On January 7, 1972 the Board adopted Rule 406 of Chapter 3 which imposed an effluent standard for ammonia nitrogen (R70-8, R71-14, R71-20, 3 PCB 401) for discharges to the Illinois River, the Des Plaines River downstream of its confluence with the Chicago River System, and the Calumet River system. Under that rule discharges to those waters by sources having an untreated ammonia wasteload of more than 50,000 P.E. (population

equivalent) shall not contain more than 2.5 mg/l of ammonia nitrogen (as N) during April through October or 4 mg/l at other times. Other discharges and dischargers were not covered, since the record was found insufficient to set standards.

Rule 406 was amended on June 28, 1973 by adding the provision that sources discharging to the listed waters and having an untreated waste load which could not be computed on a P.E. basis and which discharged greater than 100 lbs/day of ammonia nitrogen, could not discharge an effluent containing more than 3.0 mg/l of ammonia nitrogen after December 31, 1974.

Despite these effluent standards, through the operation of Rule 402, which makes it a violation for any effluent, either alone or in combination with other sources, to cause a violation of applicable water quality standards regardless of whether the discharge meets applicable effluent standards, domestic wastewater treatment facilities not subject to Rule 406 and which discharge to intermittent or low flow streams must be designed to meet the 1.5 mg/l water quality standard of Rule 203(f).

It became increasingly evident that enforcement of this 1.5 mg/l standard would force technological and economic hardship on many dischargers throughout the state. Therefore, on June 22, 1978 the Board adopted Rule 402.1 which is an exception to Rule 402 for certain ammonia nitrogen sources (R77-6, 30 PCB 579). In that proceeding the Board determined that the great economic impact of Rule 203(f) was not justified by environmental benefits and found "merit in the request for an interim exception for the existing small sources, not otherwise requiring upgrading, pending the gathering of appropriate bioassay data to either verify the existing standard established by Rule 203(f) or to establish a more appropriate one" (30 PCB 601). The adopted rule exempted those sources which have an ammonia nitrogen loading of less than sixty lbs/day and were in existence on April 1, 1977, and do not otherwise require upgrading. If a source fails to meet all three of those requirements, it must meet an effluent discharge of 4.0 mg/l during November through March. The termination date of the exception was established as July 1, 1982, which the Board believed to be "the practical minimum in which to collect the detailed data to support any necessary regulatory change and to allow for proper hearing and consideration by the Board" (30 PCB 602).

The final piece of regulatory background which is directly applicable to this proceeding concerns Rule 409 which made effluent limitations inapplicable to those facilities which were unable to meet them due to inadequacies and untimeliness of construction grant funding (R73-3, R73-4, 8 PCB 591, July 19, 1973). This was enacted as an emergency rule and had the effect of extending the compliance dates for all effluent standards which were required to be met on December 31, 1973 to December 31, 1974 for the applicable discharger.

Rule 409 was amended on July 19, 1975 (R74-17, 18 PCB 156) to extend the compliance date to July 1, 1977 due to similar grant funding difficulties and the August 29 and September 25, 1974 enactment of the National Pollutant Discharge Elimination System regulations which allowed the Agency to extend compliance to that date.

The last amendment of that rule expressed compliance dates in terms relative to the award of the construction grants rather than any particular calendar date (R75-15, 23 PCB 663, September 30, 1976).

In summary, the present ammonia nitrogen water quality standard is 1.5 mg/l, but an effluent discharger cannot be found to have caused a violation of that standard unless it fails to meet the criteria of Rule 402.1(a) and either causes that standard to be exceeded during the period of April through October or discharges an effluent with an ammonia nitrogen concentration of greater than 4.0 mg/l which causes that standard to be exceeded. Further, an effluent discharger can be found to have violated the 4 mg/l standard of Rule 402.1 only if it discharges to the applicable stream segments. Finally, under existing rules, a discharger which is out of compliance with the Rule 402.1 effluent limitation may be required to upgrade its facility to meet that standard despite being exempted from other effluent limitations by Rule 409.

RULE NUMBERING

The Board has recently codified Chapter 3: Water Pollution Control Regulations, which changed the numbering of the rules which underlie this regulatory proceeding. Therefore, the remainder of this Proposed Opinion and Order will refer to Chapter 3 rules using their codified numbers rather than their old numbers, despite the fact that the record is based upon the old system. The following table is provided to aid in referencing old Board rule numbers to section numbers pursuant to codification:

Chapter 3: Water Pollution Rule Number	35 Ill. Admin. Code Number	Rule Name
203(f)	302.208	General Use WQS* Chemical Constituents
402	304.105	Violation of WQS
402.1	304.301	Temporary Effluent Standards
406	304.122	General Effluent Standards - Nitrogen
409	304.140	Delays in Upgrading

*WQS = Water Quality Standards

RESPONSE TO COMMENTS

Following the conclusion of the first three hearings in this matter, a comment period was allowed until January 15, 1982. However, since that date was a state holiday, the Board accepted comments through January 18, 1982. Comments were received from the Agency, Illinois Power and Borg-Warner.

The Agency first contended that there is insufficient information currently available on which to base statewide revisions to the ammonia limitations. Drs. Muchmore, Heidinger and Sparks and the Agency all expressed the belief that further study was necessary before a reasoned revision of the Standards could be made. Most notably, the segment specific water quality standards review in R79-6 and the continuing studies of Heidinger and Lewis at Champaign-Urbana (C-U) Sanitary District should provide valuable data based on actual in-stream conditions. The latter study will be of particular interest in that the major interference with the fish toxicity studies included in the EcIS was associated with chlorination, whereas the C-U study will not have such interference. Further, the requirement of effluent disinfection is currently under review in R77-12 (Docket D) and may well be relaxed in the near future.

The Agency also argues strongly that the present ammonia nitrogen standard should not be changed to an un-ionized ammonia standard due to the complex chemistry associated with the equilibrium levels of ionized and un-ionized components of ammonia in Illinois streams. The Agency further argues that treatment plants are designed to comply with water quality standards during worst-case stream conditions and that as a result there would be no change in capital costs if the standard were changed to a reasonably equivalent un-ionized ammonia standard. Additionally, the Agency indicates that studies now underway by the Agency and others along with emerging analytical technology may make un-ionized standards more feasible in the near future.

The Agency finally argues that ammonia control facilities should be included in the relief provided under existing Section 304.140 (old Rule 409) which allows delays in upgrading for facilities which are eligible for federal or state grant funds. This is based upon its contention that requiring dischargers to construct ammonia control facilities without the benefit of grant funds and prior to the construction of other pollution control facilities which are covered by Section 304.140 may impose an unfair financial burden and result in inefficient facilities.

The Agency therefore recommends a five-year extension of Section 304.301 (old Rule 402.1) and amendment of Section 304.140 to allow delays in upgrading for ammonia control facilities pending receipt of grant funding.

Borg-Warner's comment suggests that the Board not only extend the Section 304.301 exemption, but that that section also be amended to exempt all industrial dischargers regardless of their ammonia nitrogen influent loading. In addition it suggests that the Board repeal section 304.122 (old Rule 406) which sets effluent standards.

Borg-Warner cites the EcIS prepared for this proceeding (Ex. 1), its own cost data, an American Petroleum Institute study, Linda Huff's economic analysis prepared for proceedings in R77-6, and USEPA's Notice of withdrawal of Proposal to add Ammonia to the Toxic Pollutants List (45 Fed. Reg. 79692, Dec. 1, 1980), among others, to demonstrate its contentions that:

1. The cost/benefit ratio for ammonia nitrogen removal by industrial dischargers is unfavorable;

2. There is no economically reasonable and technologically feasible technique to consistently meet Section 304.122 effluent standards; and

3. There is no evidence that such removal would produce any measureable environmental benefit.

Illinois Power, the third commenter, also argued that there is insufficient basis in this proceeding to warrant any new or revised ammonia nitrogen standards. It cites difficulties in accurately determining un-ionized ammonia concentrations, changes in influent pH, the lack of sufficient research, the need for stream segment classification, and some studies to support that contention. It, apparently, simply suggests an extension of the current section 304.301 exemption.

BOARD ACTION

The Board agrees that an extension of the Section 304.301 exemption is appropriate. To allow time for the Agency to complete its stream classification study in R79-6, the Board finds that at least a four-year extension is appropriate. While the Agency suggests a more liberal five-year extension, the Board will only propose a four-year extension or an extension until such time as new ammonia standards are adopted, whichever comes first, in the hope that the study can be completed expeditiously. If more time is needed, that can be dealt with near the end of the period when the Board should be much better able to determine how long any further extensions should be.

The Board also agrees with the Agency that it would be appropriate to amend Section 304.140 to insure that no facilities required to upgrade pursuant to Section 304.301 would have to do so prior to other grant eligible upgrading.

The Board will not, however, propose to amend Section 304.301 to exempt all industrial dischargers, nor will it propose repeal of Section 304.122. While it may be true that industry contributes only 5% of the ammonia nitrogen stream loading, 5% cannot be said to be insignificant. Nor is there any showing that it will remain at that level. Further, while Borg-Warner has commented upon its inability to meet present standards, there is no showing that this is generally true for industry. Therefore, there is insufficient support to warrant these blanket changes.

Industry certainly will have an opportunity in future hearings in this matter to make a more substantial showing justifying these changes. Further, Borg-Warner on its own can present evidence sufficient to support a site-specific exemption and also has the right to pursue a variance or appeal any unjustified permit conditions. The Board is well aware that statewide standards may not be appropriate in every instance, but that does not necessarily mean that the standards should be dropped in their entirety. That is the major justification of variances and site specific regulations.

The Board, while respecting the views of all commenters, will propose to modify the ammonia nitrogen standard of Section 302.208 (old Rule 203(f)) to allow the use of an un-ionized ammonia standard as an alternative to the present standards. By proposing the limitation as an alternative, the Board hopes that many of the concerns presented may be allayed. Further, the Board will remove the ammonia nitrogen water quality standard from Section 302.208 and add new Section 302.212 for that parameter alone. This is being done for purposes of administrative convenience in that no other Section 302.208 standards are alternative standards.

The proposed standard will, in effect, be a relaxation of present standards. A given discharger need not meet the present 1.5 mg/l ammonia nitrogen standard if it meets the proposed 0.04 mg/l un-ionized ammonia standard, and vice versa. Only if both standards are exceeded can a violation be found. Since the main concern in this proceeding is fish toxicity, if greater than 1.5 mg/l ammonia nitrogen can be discharged without harm to fish, that will be permitted. Further, due to present uncertainties regarding the proposed un-ionized ammonia standard, if that standard is exceeded, the Board cannot find violation unless the present standard is exceeded as well.

TECHNICAL JUSTIFICATION

The Board's addition of a 0.04 mg/l un-ionized ammonia standard as an alternative to the present 1.5 mg/l ammonia nitrogen standard is in recognition of the fact that the toxic form of ammonia nitrogen is un-ionized ammonia (R. 17). The Board will retain the present 1.5 mg/l ammonia nitrogen standard to

insure that the proposed standard is no stricter than the present standard. However, the relaxation of the present standard may reduce the dissolved oxygen (DO) level in streams due to oxidation of the ammonia by natural stream processes (R. 13, 18 and 227) and could contribute to DO violations. As a result, the Agency may have to set stricter effluent limitations in some NPDES permits to avoid this potential problem.

In aqueous solution ammonia assumes two chemical species: ionized (NH_4+) and un-ionized (NH_3, also known as molecular or undissociated ammonia). The equilibrium between ionized and un-ionized ammonia is dependent upon both pH and temperature (R. 94). As pH and temperature increase, the equilibrium shifts toward un-ionized ammonia, the toxic form. This is part of the rationale for allowing higher effluent levels of ammonia nitrogen during the winter months.

While the Agency has argued in its comment that a change to an un-ionized standard is ill-advised in that factors other than pH and temperature complicate the calculation of un-ionized ammonia from total ammonia, the present record before the Board does not substantiate that claim. Dr. Heidinger testified that calculating un-ionized ammonia "is relatively easy to do," that one can "simply measure total ammonia and calculate the percent |un-ionized ammonia\ with knowing pH and temperature" (R. 94). Conversion tables exist and those of which the Board is aware seem to be consistent. Further, there is no testimony in the record as to significant inaccuracies in such conversions.

In proposing an alternate un-ionized ammonia standard the Board has taken into consideration the levels recommended by various sources. In a recent paper by Thurston, it was recommended that water quality criteria be based on total ammonia in addition to un-ionized ammonia (Ex. 8). Dr. Heidinger testified that un-ionized ammonia concentrations of less than 0.05 mg/l did not harm low variety fish communities, i.e. those communities for which samples indicated an average of nine or fewer species (R. 128 and Ex. 1, p. 90). He also testified that a change to an un-ionized standard would better represent toxicity and "more accurately reflect the maximum level of ammonia permissable" to develop quality fisheries (R. 26).

A bio-assay study by Roseboon and Richey suggested that un-ionized ammonia levels in Illinois streams should not exceed 0.04 mg/l if sensitive fish species are to be protected (Ex. 1, p. 21). This, in conjunction with findings by Ellis that total ammonia nitrogen levels should not exceed 2 mg/l if desirable fish communities are to be protected (Ex. 1, p. 21), tends to indicate that the proposed alternative standard should be adequate to protect fish.

Finally, although the "Red Book" recommends a maximum un-ionized ammonia level of 0.02 mg/l, when asked his opinion of a 0.04 mg/l standard, Heidinger testified that he was "comfortable"

with it in terms of what he called low diversity (variety) streams and "fairly comfortable" with it for high diversity (variety) streams (R. 90). He went on to state, however, that the problem from a biological standpoint is that current information in terms of very sensitive species is incomplete.

The Board hopes that future hearings will provide more information on the un-ionized ammonia standard issue.

ORDER

The Board hereby proposed the following amendments to Chapter 3 (deleted language is lined through; added language is underlined):

Section 302.208 Chemical Constituents

The following levels of chemical constituents shall not be exceeded:

CONSTITUENT	STORET NUMBER	CONCENTRATION (mg/l)
~~Ammonia-Nitrogen-(as-N)~~	~~00610~~	~~1.5~~
Arsenic (total)	01002	1.0
Barium (total)	01007	5.0
Boron (total)	01022	1.0
Cadmium (total)	01027	0.5
Chloride	00940	500.
Chromium (total hexavalent)	01032	0.05
Chromium (total trivalent)	01033	1.0
Copper (total)	01042	0.02
Cyanide	00720	0.025
Fluoride	00951	1.4
Iron (total)	01045	1.0
Lead (total)	01051	0.1
Manganese (total)	01055	1.0
Mercury (total)	71900	0.0005
Nickel (total)	01067	1.0
Phenols	32730	0.1
Selenium (total)	01147	1.0
Silver	01077	0.005
Sulfate	00945	500.
Total Dissolved Solids	70300	1000.
Zinc	01092	1.0

Source: Filed with Secretary of State January 1, 1978; amended 2 Ill. Reg. no. 44, page 151, November 3, 1978; effective November 2, 1978; amended 3 Ill. Reg. no. 20, page 95, May 18, 1978, effective codified 6 Ill. Reg. , amended 6 Ill. Reg.

Section 302.212 Ammonia Nitrogen and Un-ionized Ammonia

Ammonia nitrogen (as N: STORET number 31616) shall not exceed 1.5 mg/l if at the same time un-ionized ammonia exceeds 0.04 mg/l.
Source: 6 Ill. Reg.

SUBPART (C): TEMPORARY EFFLUENT STANDARDS

Section 304.301 Exception for Ammonia Nitrogen Water Quality Violations

a. Secion 304.105 shall not apply to ~~that portion of~~ Section 302.212 ~~302.208 pertaining to ammonia nitrogen~~ for any effluent from a source in existence on April 1, 1977, having an untreated ammonia influent loading not exceeding 60 pounds per day and not otherwise needing upgrading to meet the requirements of this chapter.

b. Section 304.105 shall not apply to ~~that portion of~~ Section 302.212 ~~302.208 pertaining to ammonia nitrogen~~ for any source during the months of November through March; except that during the months of November through March no source, not exempt under paragraph (a) shall discharge an effluent containing a concentration of ammonia nitrogen greater than 4.0 mg/l if the discharge, alone or in combination with other discharges, causes or contributes to a violation of that portion of Section ~~302.208~~, 302.121 ~~pertaining to ammonia nitrogen.~~

c. Compliance with the provisions of paragraph (b) shall be achieved by March 31, 1979, or such other date as required by NPDES permit, or as ordered by the Board under Title VIII or Title IX of the Environmental Protection Act.

d. After July 1, 1986, the exemptions provided in this section shall terminate.

Source: 2 Ill. Reg. no. 30, page 343, July 28, 1978, effective July 27, 1978; codified, 6 Ill. Reg. , amended 6 Ill. Reg.

Section 304.140 Delays in Upgrading

a. All effluent standards required to be met on December 31, 1973 or December 31, 1974 and in response to Section 304.301 shall be met unless:

1. The discharger is eligible for a construction grant under Section 201(g) of the Clean Water Act; and,

2. The discharger has filed an application for a construction grant on or before December 31, 1975; and,

3. The discharger has timely taken all necessary pre-grant and post-grant actions appropriate to the specific grant step for which the discharger is then eligible.

4. The exemption provided in (a)(1), (a)(2) and (a)(3) above shall terminate upon completion of construction under the grant provided and compliance with the provisions of this Section shall thereafter be required.

Source: Filed with Secretary of State January 1, 1978; Codified 6 Ill. Reg. ; Amended 6 Ill. Reg.

IT IS SO ORDERED.

I, Christan L. Moffett, Clerk of the Illinois Pollution Control Board, hereby certify that the above Opinion and Order was adopted on the 4th day of February, 1982 by a vote of 4-0.

Christan L. Moffett, Clerk
Illinois Pollution Control Board