

ILLINOIS POLLUTION CONTROL BOARD
November 8, 1973

IN THE MATTER OF WATER QUALITY
STANDARDS REVISIONS

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R72-4

OPINION OF THE BOARD (by Mr. Dumelle):

This Opinion of the Board is in support of amendments to Chapter 3 of the Pollution Control Board's Water Pollution Regulations adopted on June 28, 1973. These amendments were consolidated from revisions proposed by the Board, the Environmental Protection Agency (Agency), Granite City Steel, The Metropolitan Sanitary District of Greater Chicago (MSDGC), and Commonwealth Edison Company. After reviewing the record produced in ten hearings, the Board adopted the amendments as published in the Newsletter #65, May 17, 1973, with two revisions that were published in Newsletter #69, July 16, 1973. The Amendments were first published in Newsletter #50, July 14, 1972. Hearings were held in six cities throughout Illinois.

1. The first group of amendments were proposed by the Board. An amendment to Sec. 406 Nitrogen was proposed and adopted to control industrial dischargers of more than 100 lbs. of ammonia as N, whose wasteload cannot be computed on a population equivalent (PE) basis. Such industrial dischargers who discharge into the Illinois River, Chicago River System or Calumet River System will be subject to an ammonia effluent standard of 3.0 mg/l as N after December 31, 1974. The Board found that present technology is capable of meeting this limit and should result in the removal of much ammonia nitrification oxygen demand (NOD) from these stressed waterways. Ammonia removal from such industrial wastes, when compared with removal from domestic wastes is rather easily applied (R. 25, September 13, 1972).

The definition of "water" in Section 104 Definitions was amended by the Board to add a clause that allows the use of in-stream aeration under Agency permit.

Another Board proposal would have allowed the Agency to require bonds as a condition to obtain an Agency permit. After considering their revision, the Board declined to adopt the proposed new Section 926.

2. Another group of amendments which were proposed by the Agency, were received on April 7, 1972. The first of the Agency proposals was to amend Section 103 Repeals to repeal SWB-2 and SWB-17, and to replace SWB-2 with a new Part XII: Treatment Plant Operation Certification. SWB-2 and SWB-17 were adopted by the Illinois Sanitary Water Board and continued in effect by Section 49(c) of the Environmental Protection Act "until repealed, amended, or superseded by regulations under this Act." SWB-2 set rigid regulations that governed the certification of treatment plant operators by the Agency. The Agency desired this amendment to permit them a greater flexibility to change certification requirements with technological developments. As a result of discussion concerning this amendment the Agency proposed an addition to Part XII to insure that an applicant could appeal his certification denial to the Board. The Board adopted the repeal of SWB-2 and the addition of Part XII in order to allow the Agency to cope with various problems such as how to certify the 400 MSDGC plant operators. The Agency sought the repeal of SWB-17 because of language that might be construed to conflict with the act which gives the Agency exclusive control of the administration of Federal grant monies. The Board agreed and amended Section 103 to repeal SWB-17 which had set out rules for establishing priorities for awarding Federal monies in order to avoid any conflict with the Act.

The next portion of the Agency proposal dealt with a relatively minor group of amendments to correct or supply missing STORET NUMBERS in the following Sections: 203(f), 204(b), 206(c), and 408(a). The Agency proposed a correction of a typographical error in the placement of the phrase "for excess energy" within Section 104 Definitions "Industrial Wastes". A correction of misspelled words in Section 501, 502 and 912 was also proposed. The Board adopted these changes as published in Newsletter #65, May 17, 1973.

The Agency proposed to amend Section 302 Restricted Use Waters by adding a clause to require that the Board hold hearings in 1973 and every 5 years thereafter to determine whether any Restricted Use Water should be reclassified as a General Use Water. This amendment is in response to the Federal Environmental Protection Agency (U.S. EPA) policy not to approve restricted use status as a permanent status for any water (R. 11, September 13, 1972 and Ex. #4). In addition to the Federal objection, the revision would give notice to those who are currently discharging into Restricted Use Waters that they are not permanently guaranteed such use (R. 12, September 14, 1972). The Board agreed with the Agency's reasoning and adopted its amendment to reflect a limitation on the Restricted Use designation.

The Agency proposed a change in Section 404(f)(ii)B to substitute "the levels set by the applicable water quality standard" for the previously specified numerical DO level. The Board approved this clarification and adopted the amendment.

The Agency proposed amending Section 405 Bacteria by addition of "governed by this part" to clarify the wording which requires disinfection of combined overflows by July 31, 1972. The deletion of the language referring to SWB-7 through SWB-15 was also proposed. The Agency also proposed establishing a later deadline of December 31, 1973 for discharges into the Ohio and Mississippi Rivers. Regulations passed by the Board in 1971 (R. 70-3 and 71-3) required disinfection of combined overflows discharging into the Ohio and Mississippi Rivers by December 31, 1973. When the Board amended this regulation in R70-7, 71-14 and 71-20 it unintentionally accelerated the deadline for Ohio and Mississippi River discharges. The Board adopted this amendment to correct a previous error.

The Agency proposed that Section 406 Nitrogen be amended to include the Des Plaines downstream of its confluence with the Chicago River System in those waters which have an effluent limitation on ammonia. The Board approved this amendment because it conforms to the Board's original intent when it placed ammonia effluents on the other waterways listed in this Section.

The Agency proposed a specific standard of 0.025 mg/l as a limit for discharges of cyanide into a public sewer system. Section 702(a) Cyanide previously had read "detectable levels of cyanide". The Board adopted this as a parallel to the Water Quality Standard of 0.025 mg/l found in Section 203.

The Agency proposed the deletion of "by the Agency" in Section 942 Permit Revocation to conform to the Board's desire that all permit revocations take place only as a result of a complaint and action brought before the Board. The Board amended Section 942 to conform with this policy.

3. Granite City Steel Company proposed an amendment to reclassify Horseshoe Lake from Public and Food Processing Water Supply to General Use (Section 303). The Board received the proposal on July 6, 1972. The basis for their request was that Horseshoe Lake had never and would never be used for a public or food processing water supply and thus should not be classified as such. Various company officials so testified in support of their proposal (R. 32, 84, and 111, September 22, 1972). Granite City Steel's Engineering Consultant, Mr. John Huston, testified that the Lake did not meet the drinking water standards required as a source of public waters. The Agency testified that in their view an amendment of the rules regarding Horseshoe Lake is not needed at the present time (R. 10, September 22, 1972). The Board finds that there is no need to reclassify Horseshoe Lake as a general use water (Section 301) and to take it out of Section 303 Public and Food Processing Water Supply

because of the extreme unlikelihood that the Lake will ever be used as a public water supply and thus such standards may never become operative.

4. The MSDGC proposed an amendment to Section 404(e) Deoxygenating Wastes to change the effluent limits to 10 mg/l BOD₅ and 12 mg/l suspended solids (SS) from 4 mg/l BOD₅ and 5 mg/l SS. The Board received the proposal on April 25, 1972. At the hearing, the Agency stated that they did not oppose the amendment (R. 17, 9/13/72). The original purpose of requiring the MSDGC to meet a 4 mg/l BOD₅ and 5 mg/l SS was to remove deoxygenating wastes from their effluent and thus allow the DO in the downstream waterways to reach the level prescribed by the existing standard. During periods of low flow up to 99% of the flow in the sanitary district's controlled waterways is made of MSDGC effluent.

Evidence presented by Mr. Ralph Evans, Illinois Water Quality Survey, tends to show that, even with the MSDGC meeting the 4-5 effluent standard, the Illinois River at Marseilles and Starved Rock will not meet the DO standard of 6 and will be in fact less than 4 mg/l DO (R. 114, 10/19/72). Even if the oxygen demand exerted by nitrofication of ammonia (NOD) was zero, the model predicts that a DO level of 6 is not obtainable (R. 124, 10/19/72). Modeling conducted by the MSDGC also predicts that both 4 mg/l BOD₅ and 5 mg/l SS and 10 mg/l BOD₅ and 12 mg/l SS will not achieve a DO level of 6 mg/l (R. 283, 10/19/72).

The MSDGC proposed to amend the standard to require them to meet 10-12 instead of 4-5. They propose to carry out instream-aeration to raise the DO level to 6.0 mg/l. MSDGC presented modeling evidence that showed an effluent of 4-5 would result in an instream BOD₅ level of 2.4 mg/l with a DO level of 4.4 mg/l; while an effluent of 10-12 would result in an instream BOD₅ level of 2.6 mg/l with a DO level of 4.2 mg/l (R. 17, 10/20/72). Evidence shows the predicted cost of meeting the 4-5 standards is \$236.7 million dollars with an operational cost of \$26 million dollars. The cost of 10-12 with instream aeration is \$138.8 million dollars with an operating cost of \$16 million dollars per year (R. 19, 10/20/72).

Two eminent professionals, Clair Sawyer and General Whipple, both testified that the most economic way for the MSDGC to meet the required DO levels is by 10-12 and instream aeration (R. 223, 235, 10/20/72). Dr. Sawyer testified the downstream DO problems should be eliminated once the MSDGC begins to remove the NOD by nitrification (R. 248, 10/20/72). Every pound of NOD is equal to 4.57 pounds of BOD₅ (R. 254, 10/20/72). Dr. Sawyer testified that the NOD (ammonia₅ oxygen demand) could be easily reduced below 2.5 mg/l (R. 257, 10/20/72).

The Board decided to delete Section 404(b) instead of amending it as proposed by the MSDGC. By deleting the requirement, the intention of the Board (reading both Section 404(c) and (f) together) was to require the MSDGC to meet 4 mg/l of BOD₅ and 5 mg/l of SS by December 13, 1977 unless it can show through Section 404(f)(ii) that such an effluent standard is not required. In the event that MSDGC can meet the burden required in Section 404 (f)(ii) it is subject to an effluent standard of 10 mg/l of BOD₅ and 12 mg/l of SS. (See pages 14-16, of the Board's Opinion accompanying R70-8, 71-14 and 71-20, for the reasoning supporting the creation of a conditional exemption from the 4 mg/l BOD₅ and 5 mg/l SS limit). The Board based its decision upon the modeling evidence presented and by the testimony which showed that DO standard would be met by 10 mg/l, BOD₅ and 12 mg/l of SS, in-stream aeration and nitrification.

5. Commonwealth Edison proposed an amendment in the alternative on March 30, 1972, to loosen the temperature standard on the Des Plaines River below the Interstate 55 bridge to its confluence with the Kankakee River (hereinafter cited as "5 mile stretch"). The first alternative would have amended Section 302(i) Restrictive Use Waters to delete the phrase "to the Interstate 55 bridge" and replace it with the phrase "to its confluence with the Kankakee River." Edison's second alternative would have amended Section 203(i)(4) by adding "Des Plaines River from the Interstate 55 bridge to its confluence with the Kankakee River. Temperature in this segment of the Des Plaines River shall not exceed 92°F more than five percent of the time, by more than 5°F." In response to a request from Hearing Officer Parker to tighten up its proposal to reflect the minimum temperatures possible, Edison withdrew its original amendments on November 29, and substituted an amendment to Section 203(i)(4) which proposed individual monthly temperature limits, corresponding to historical data, for the "5 mile stretch". This final amendment also contained a 5% excursion up to 5°F maximum from the monthly limits.

Commonwealth Edison's Joliet Plant is located on the Des Plaines River 7.3 miles upstream of the I-55 bridge. Heated water from both the old and new portions of the plant is discharged to the river through once-through cooling systems. After the heated water is discharged it mixes with the River water and gradually cools as heat dissipates to the atmosphere. The river water temperature, gradually decreases with distance downstream from the power plant. Edison presented evidence that the water does not cool sufficiently by the time it reaches the I-55 bridge to meet the general use temperature limits during July and August. The temperature at the I-55 bridge would be the highest in the "5 mile stretch" (Ex. #3, Edison Ex. 25, page 5).

The final proposed amendment dropped the alternative to amend Section 302(i) and proposed individual monthly temperature limits for the five mile stretch from I-55 bridge to the confluence with the Kankakee River. The Board adopted the final Edison amendment as published with some exceptions. It set 90°F as the maximum temperature standard for the months of July and August and reduced the excursion to four percent of the previous twelve month period. The Board also set an automatic termination date of July 1, 1978 at which time the general use temperature standard will again apply.

Edison desired to amend the temperature limit to avoid the necessity of providing cooling for its Joliet Power Plant which consists of two parts located on either side of the Des Plaines River some 7.3 miles upstream from the I-55 bridge. (R. 32, 9/8/72) The Board in a previous decision adopting the revised Water Quality Standards (R. 71-14, March 7, 1972) classified the Des Plaines River from the confluence with the Canal at Lockport to the I-55 bridge as "restricted" use water (Section 302(i). Its temperature limits are 93°F (not to be exceeded more than 5% of the time) or 100°F at any time (Section 205(f). At the I-55 bridge, a discontinuity in temperature limit exists as the river below the bridge is classified as a "General Use" water with the more restrictive water temperature limits contained in Rule 203(i)(4). The basis for the Board's decision to use the I-55 bridge as a boundary for the division of the Des Plaines River into restrictive and general use is that the location of the bridge corresponds to changes in the physical environmental characteristics of the area (R. 71-14 at page 11, March 3, 1972). Above the bridge, the river has been greatly altered by man so that it is not as suited for recreation, (Ex. #3, Edison Ex. 25, page 4) and water quality is such that at the present time it is not capable of supporting a diverse aquatic life (Ex. #3, Edison Ex. 25, page 4). Edison witnesses expressly excluded the 5 mile stretch below the bridge, from possessing the characteristic that led the Board to classify the upper river as Restrictive Use.

The Board previously decided that the I-55 bridge should be the dividing line between the upstream Restricted Use designations and the downstream General Use designation in R71-14. The Board considered over 800 pages of record and numerous exhibits before reaching its decision on Edison's amendment. Edison's amendment is based upon historical water data it collected during 1966 to 1971 by use of continuous monitors located throughout the lower Des Plaines waterway system. This data was submitted in Edison exhibits 47-62. However, no temperature data was recorded at the I-55 bridge. Edison carried out extrapolations using the temperature data to arrive at a probable water temperature at the I-55 bridge. The two closest recorded locations are 3.3 and 4.3 miles from the bridge.

The maximum water temperatures extrapolated to the I-55 bridge showed that 61 occurrences existed above 90°F during the monitored period. (Ex. #3, Edison Ex. 47, Table 1) This data supports the statement made during the hearings that the "summer of 1966 shows some of the warmest water temperature periods recorded in recent decades"

(Ex. #3, Edison Ex. 47, page 2). Thus any standard based upon this historical data should reflect a longer period of time than the five year data period. Edison's data clearly demonstrates that the present Section 203(i) was violated 19 days during July, 1966.

Edison presented testimony concerning in-plant cooling based on the maximum reduction in heat discharge required to lower the observed water temperatures to that required by Rule 203(i). Edison stated that operation at partial load to achieve the required reduction in thermal discharge is not possible because the critical period of water temperatures coincides with the system wide peaks that require maximum power production from the Joliet Power Plant. To meet the general use standard, at the I-55 bridge, Edison estimated it would have to spend \$21.9 million dollars to construct cooling towers on the new side if the critical load is less than 75% of capacity (Ex. #3, Edison Ex. 66, page 2).

Dr. Lauer, an Edison witness, testified that Edison's discharge of hot water would have a limited effect on the aquatic life use of the Lower Des Plaines River (Ex. #3, Edison Exs. 17, 37, and 38). He stated in his opinion, the maximum effect of the temperatures allowed by Edison's proposed amendment would be that 785 pounds of fish would move out of the "5 mile stretch" and into cooler water for up to two weeks of the year (Edison Ex. 17 and 38, 10). Edison presented a cost-benefit analyses which concluded, based upon a fish harvest of 100 pounds per acre per year, that the fish would have to be worth \$27.91 per pound to warrant cooling towers (Ex. #3, Edison Ex. 26, Page 4). Dr. Upton further testified that based upon a more conservative fish harvest, the fish would "in reality" have to be worth \$1,395 per pound (Ex. #3, Edison Ex. 26, Page 6).

Substantial opposition to Edison's proposal was voiced by the Agency, U.S. EPA and by several citizen witnesses. The U.S. EPA objected to any reclassification of a water into the Restricted Use category because of its policy to oppose to such a classification. The U.S. EPA, in conjunction with the Illinois Conservation Department collected fish on May 16, 1972 from five locations within the "five mile stretch" (Ex. #2, Milburn). The total catch consisted of 156 fish; including goldfish, emerald shiners, northern redhorse, white crappie, white suckers, gizzard shad, channel catfish and rock bass. Edison's consultant also conducted a fish survey, Ex. #3, Edison Ex. 44, at one location in the "5 mile stretch" and collected 19 fish; including goldfish, carp and quillback. Although these surveys disclosed that fish species were more diversified in either the Kankakee or Illinois Rivers than in the Lower Des Plaines, the Lower Des Plaines is capable of supporting a desirable aquatic biota (R. 109, 9/14/72). The presence of benthic organisms supports the conclusion that the fish are not just passing through because bottom feeding fish have a source of food (R. 109, 9/14/72).

Evidence of the effects of temperature on various fish species is documented in Exhibit 31, and Ex. #3, Edison Exhibits 38, 41 and 76. In Exhibit 31 the Duluth National Water Quality Laboratory recommends maximum weekly average temperatures for the Illinois Rivers. These values are derived from data of lethal temperatures, maximum temperatures, reproduction and growth and should result in "maintenance of reasonably good populations of most species to be protected". When compared to proposed temperature limits for the "five mile stretch", the recommendations of the Water Quality Laboratory are considerably lower. Edison has presented evidence that diversified fish populations exist in Dresden Lake pools which have water temperatures ranging from 96.8°F to 86°F. This presents evidence that some fish can acclimate to high water temperatures when confined in an elevated temperature body of water (Ex. #3, Edison Ex. 41). But fish in the Des Plaines River are not confined.

The Board finds that the lower "five mile stretch" is capable of providing a source of recreation badly needed in the area (R. 107, 9/14/72), and is supporting a limited desirable aquatic biota.

The Board reduced Edison's proposed 92°F temperature limit during July and August to 90°F in order to give protection to this aquatic life. Dr. Lauer testified that 90°F is recognized as a temperature which will begin to affect some individual species (R. 277, 11/29/72). A maximum temperature limit of 90°F is recognized as necessary to protect fish (R. 219, 11/29/72, Ex. #3, Edison Ex. 39, reference 5, page 57).

The Board reduced the allowable excursion to 4% of the previous year not to exceed 5°F after reviewing Ex. #3, Edison Ex. 47, Table I, Support Table B. An excursion of 4% would allow up to 14.6 days per year. The Board finds that this excursion more closely reflects the historical data. It should be noted that projected excursion temperatures are in fact "projected" values not measured values. Significant problems are present when actually measuring temperatures due to differing temperatures which exist across the width and depth of a body of water. A projection based upon temperature necessarily reflects such problems.

The Board decided to add Section 203(i)(9), which cancels the special temperature limits on July 1, 1978, as middle ground between Edison's proposal and the need to protect aquatic life. Evidence was presented that temperature is not presently the limiting factor which restricts aquatic life in the "5 mile stretch". (Ex. #3, Edison Ex. 7, pages 3-4) However, additional evidence was presented during the hearing that water quality in the Des Plaines will be improved as the MSDGC, which is the major pollution source, further reduced the pollutants contained in its effluent.

The MSDGC is required by Section 404(f) to produce an effluent which shall not exceed 4 mg/l BOD₅ or 5 mg/l SS on or before December 31, 1977. They are required by Section 406 to limit their ammonia discharges to 2.5 mg/l during April through October, or 4 mg/l other times, after December 31, 1977. Dr. Sawyer testified that DO problems below Lockport will be resolved by ammonia removal (R. 248, 10/19/72). The MSDGC has stated that they are going to conduct instream-aeration to raise the DO level to 6.0 mg/l (See pages 4 and 5 of this Opinion for discussion of instream aeration plans of MSDGC). They are required to treat or remove combined sewer overflows by December 31, 1977 (Section 602(d)), and work on the proposed "deep tunnel" is underway. All of these projects are designated or required to be completed before July 1978 with the resulting reduction of the pollution load to the Des Plaines River. The Board finds that by July 1978, temperature will be the limiting factor to the attainment of a desirable aquatic biota in the Des Plaines River below the I-55 bridge.


The July 1, 1978, termination date for the specific temperature standard is reasonable in light of the special circumstances presented in this fact situation. It is a Board policy to protect and enhance the quality of the aquatic environment whenever possible. Large discharges of heated water disturb the aquatic environment. The water quality in the Lower Des Plaines River is presently depressed by discharges from upstream sources such as the MSDGC. Such dischargers are currently under orders, or required by Board regulations, to reduce their discharges by 1977 and are planning to implement remedial programs to further enhance water quality. Water quality in the "five-mile stretch", should be the limiting factor to obtain or support a desirable aquatic life by 1978. The termination of thermal standards, which allowed discharges that limit the aquatic biota, is therefore necessary to protect aquatic life in the lower "five-mile stretch".

Edison is required by Sec. 203(i)(5) to conduct a program to monitor the affects of their discharges of heated water from the Joliet Plant and present the results of that program to the Board at a hearing to be held between March, 1977 and March 1978. If, at that time, the Board is convinced that Edison's discharge has not caused, or is not reasonably expected to cause significant ecological damage to the Des Plaines River; the Board would not require Edison to construct cooling facilities. Edison could then either ask the Board to amend its regulation to extend to the termination date to reflect water quality as would then be present in the "five-mile stretch", or seek a variance from the standard. But if the Board is convinced that Edison has caused or is reasonably expected to cause significant ecological damage in the future, then the Board is required by Section 203(i)(5) to order Edison to carry out appropriate

measures to correct ecological damage. Edison, because it had relied upon existing Board regulations, would have the variance procedure available to seek time to correct the problem.

The Board notes that cost benefit analyses, as used by Edison, would result in the allowance of large thermal discharges on even small trout streams since it is likely that a lake or artificial stream for fishing purposes could be built for less money than cooling facilities.

I, Christan L. Moffett, Clerk of the Illinois Pollution Control Board, hereby certify the above Opinion was adopted on the 8th day of November, 1973 by a vote of 5-0.



Christan L. Moffett, Clerk
Illinois Pollution Control Board